January 1982
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80 microcomputing™

the magazine for TRS-80® users

A WAYNE GREEN PUBLICATION

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TRS-80* COMPUTING EDITION

©1981 Percom Data Co., Inc. — The Percom Peripheral — 35 cents

Percom's DOUBLER II™ tolerates wide variations in media, drives

GARLAND, TEXAS — May 22, 1981 — Harold Mauch, president of Percom Data Company, announced here today that an improved version of the Company's innovative DOUBLER™ adapter, a double-density plug-in module for TRS-80* Model I computers, is now available.

Reflecting design refinements based on both theoretical analyses and field testing, the DOUBLER II™, so named, permits even greater tolerance in variations among media and drives than the previous design.

Like the original DOUBLER, the DOUBLER II plugs into the drive controller IC socket of a TRS-80 Model I Expansion Interface and permits a user to run either single- or double-density diskettes on a Model I.

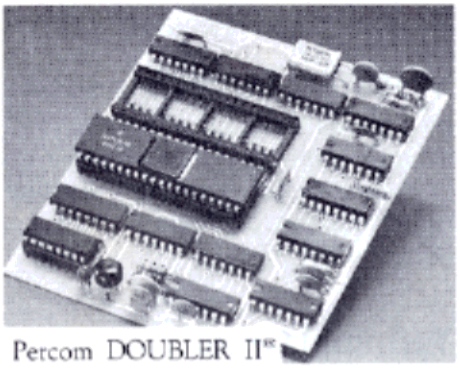
With a DOUBLER II installed, over four times more formatted data — as much as 364 Kbytes — can be stored on one side of a five-inch diskette than can be stored using a standard Tandy Model I drive system.

Moreover, a DOUBLER II equips a Model I with the hardware required to run Model III diskettes.

(*Ed. Note:* See "OS-80™: Bridging the TRS-80* software compatibility gap" elsewhere on this page.)

The critical clock-data separation circuitry of the DOUBLER II is a proprietary design *called a ROM-programmed digital phase-lock loop data separator.*

According to Mauch, this design is more tolerant of differences from diskette to diskette and drive to drive, and also provides *immunity to performance degradation caused by circuit component aging.*



Percom DOUBLER II™

Mauch said "A DOUBLER II will operate just as reliably two years after it is installed as it will two days after installation."

The digital phase-lock loop also *eliminates the need for trimmer adjustments typical of analog phase-lock loop circuits.*

"You plug in a Percom DOUBLER II and then forget it," he said.

The DOUBLER II also features a refined Write Precompensation circuit that more effectively minimizes the phenomena of bit-and peak-shifting, a reliability-impairing characteristic of magnetic data recording.

The DOUBLER II, which is fully software compatible with the previous DOUBLER, is supplied with DBLDOS™, a TRSDOS*-compatible disk operating system.

The DOUBLER II sells for ~~$2[illegible].95~~ Now $169.95!, including the DBLDOS diskette.

Owners of original DOUBLERs may purchase a DOUBLER II upgrade kit, without the disk controller IC, for $30.00. Proof of purchase of an original DOUBLER is required, and each DOUBLER owner may purchase only one DOUBLER II at the $30.00 price.

The Percom DOUBLER II is available from authorized Percom retailers, or may be ordered direct from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty.

r-258

All that glitters is not gold

OS-80™ Bridging the TRS-80* software compatibility gap

Compatibility between TRS-80* Model I diskettes and the new Model III is about as genuine as a gold-plated lead Krugerrand.

True, Model I TRSDOS* diskettes can be read on a Model III. But first they must be converted and re-recorded for Model III operation.

And you *cannot* write to a Model I TRSDOS* diskette. Not with a Model III. You cannot add a file. Delete a file. Or in any way modify a Model I TRSDOS diskette with a Model III computer.

Furthermore, your converted TRSDOS diskettes cannot be converted *back* for Model I operation.

TRSDOS is a one-way street. And there's no retreating. A point to consider before switching the company's payroll to your new Model III.

Real software compatibility should allow the direct, *immediate* interchangeability of Model I and Model III diskettes. No read-only limitations, no conversion/re-recording steps and no chance to be left high and dry with Model III diskettes that can't be run on a Model I.

What's the answer? The answer is Percom's OS-80™ family of TRS-80 disk operating systems.

OS-80 programs allow *direct, immediate* interchangeability of Model I and Model III diskettes.

You can run Model I single-density diskettes on a Model III: install Percom's plug-in DOUBLER™ adapter in your Model I, and you can run double-density Model III diskettes on a Model I.

There's no conversion, no re-recording.

Slip an OS-80 diskette out of your Model I and insert it directly in a Model III.

And vice-versa.

Just have the correct OS-80 disk operating system — OS-80, OS-80D or OS-80/III — in each computer.

Moreover, with OS-80 systems, you can add, delete, and update files. You can read *and write* diskettes regardless of the system of origin.

OS-80 is the original Percom TRS-80 DOS for BASIC programmers.

Even OS-80 utilities are written in BASIC.

OS-80 is the Percom system about which a user wrote, in Creative Computing magazine, ". . . the best $30.00 you will ever spend."†

Requiring only seven Kbytes of memory, OS-80 disk operating systems reside completely in RAM. There's no need to dedicate a drive exclusively for a system diskette.

And, unlike TRSDOS, you *can* work at the track sector level, defining and controlling data formats — in BASIC — to create simple or complex data structures that execute more quickly than TRSDOS files.

The Percom OS-80 DOS supports single-density operation of the Model I computer — price is $29.95; the OS-80D supports double-density operation of Model I computers equipped with a DOUBLER or DOUBLER II; and, OS-80/III — for the Model III of course — supports both single- and double-density operation. OS-80D and OS-80/III each sell for $49.95.

r-429

Circuit misapplication causes diskette read, format problems.

High resolution key to reliable data separation

GARLAND, TEXAS — The Percom SEPARATOR™ does very well for the Radio Shack TRS-80* Model I computer what the Tandy disk controller does poorly at best: *reliably* separates clock and data signals during disk-read operations.

Unreliable data-clock separation causes format verification failures and repeated read retries.

CRC ERROR–TRACK LOCKED OUT

The problem is most severe on high-number (high-density) inner file tracks.

As reported earlier, the clock-data separation problem was traced by Percom to misapplication of the internal separator of the 1771 drive controller IC used in the Model I.

The Percom Separator substitutes a *high-resolution* digital data separator circuit, one which operates at 16 megahertz, for the low-resolution one-megahertz circuit of the Tandy design.

Separator circuits that operate at lower frequencies — for example, two- or four-megahertz — were found by Percom to provide only marginally improved performance over the original Tandy circuit.

The Percom solution is a simple adapter that plugs into the drive controller of the Expansion Interface (EI).

Not a kit — some vendors supply an untested separator kit of resistors, ICs and other paraphernalia that may be installed by modifying the computer — the Percom SEPARATOR is a fully assembled, fully tested plug-in module.

Installation involves merely plugging the SEPARATOR into the Model I EI disk controller chip socket, and plugging the controller chip into a socket on the SEPARATOR.

The SEPARATOR, which sells for only $29.95, may be purchased from authorized Percom retailers or ordered directly from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty.

r-1

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80 Contents

Videotext for the Masses 60

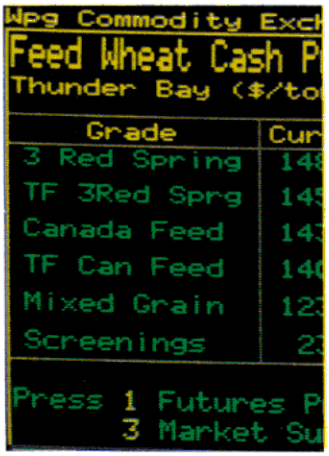
by Michael Nadeau

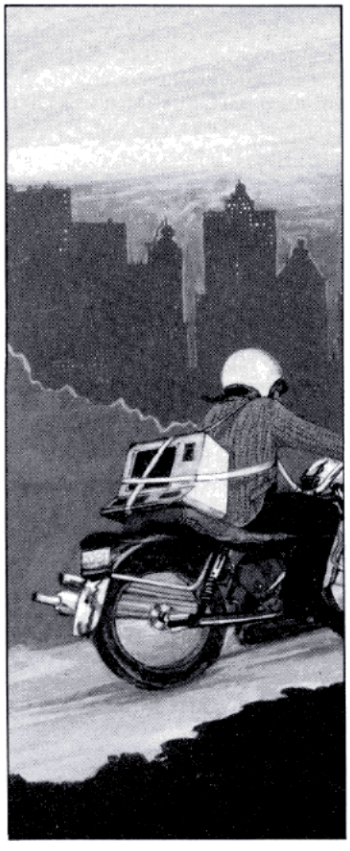
When computer executives talk about the "Information Revolution," they may be stirring the ashes of Uncle Karl without really knowing it.

Terminal Case 66

by G. Bert Latamore

The Canadians have adopted the European approach to videotext—an approach that doesn't always take into account the wants of the proletariat.





A Little Pascal, Part II 80

by Margaret M. Grothman

Readers slightly blue from holding their breath waiting for the followup to Ms. Grothman's first piece may at last inhale.

Get the Business 92

For those of you who read our November business issue and thirsted for more, imbibe: Dan Keen and Dave Dischert introduce you to Cobol and explain spanning disks on the Model II; Edwin Dethlefsen shows you how your pocket computer can become an investment portfolio; John D. Eaton (*) helps you track the rising cost of materials; Jerry Rutledge (*) makes tabulating survey results easy; and Steven M. Zimmerman and Leo M. Conrad (*) write about manipulating loans.

Buyer's Guide to Disk Drives 179

For those of you frustrated by CLOADing for the last time, a potpourri of disk drives from the mini-floppy to Winchester technology.

APPLICATIONS

174 **No More 90-Pound Weakling** Charles Atlas in your Pocket Computer. *Guerri F. Stevens*

308 **If This is Tuesday, It Must be . . .** Happy Birthday from your Pocket Computer. *Walter J. Atkins*

GAME

265 **Martian Missile Attack** No city on earth is safe! *Charles E. Gillen*

302 **Micro Puzzle Box** A venerable game in a new box. *David Moews*

PUBLISHER/EDITOR
Wayne Green

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Sherry Smythe

ASSISTANT TO PRESIDENT
Matt Smith

ASSOCIATE PUBLISHER
Edward Ferman

ASSISTANT PUBLISHER
Jeff DeTray

DIRECTOR OF MARKETING
(603) 924-7296
Debra Boudrieau

BULK SALES MANAGER
Ginny Boudrieau

ADVERTISING SALES
(603) 924-7138
John Gancarz
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Sales Coordinator: Penny Brooks
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GENERAL

* 140 **The Ultimate Parts Manager** For Model T fanatics only. *Bruce W. McCalley*

HARDWARE

172 **Do-It-Yourself Disks** Install Model III internal drives. *James S. Schaeffer*
244 **Digital Doodles** Build a low cost plotter. *Alan Stehmer*
288 **Those CLOAD Blues** How to end them. *Don Hartjes*
294 **Double Your Density** Without Model I hassles. *Allen J. Domuret*
316 **Model I, Meet Model III** Make them kissing kin. *Mike Barrow and Jim Brydges*

INTERFACE

318 **The Straight Shooter** El Cheapo light pen. *Thomas C. Quindry*

REVIEWS

72 **It's a Big, Big Colorful World** . . . when you hook your Color Computer into CompuServe. *Howard Berenbon*
122 **The Plot Thickens** A look at Radio Shack's plotter-printer. *Don DeJarnette*
126 **TASMON** A machine-language monitor. *Rowland Archer*
132 **Making Basic a Snapp** An auto map you won't use with your car. *Rick Lederman*
218 **What's a TRZ-80?** No, not another new product from Kitchen Table Software. *Eric Lindsay*

TECHNIQUE

* 190 **Alpha Graphics** There's no money in these dollar signs, just graphics. *Larry Basch*
258 **Add That Professional Touch** Look like a programmer. Be a programmer. *Joe C. Steelhammer*
274 **Programmer for Hire** Have Computer, Will Program. *Dennis J. Gillig*
276 **The Flasher** Make that loafer work. *Everitt Mickey*
278 **Unmasking Your Z80** . . . with the help of computer interruptus. *R.F. Genovese*
290 **Using Print Using** A lesson in a Basic function. *Chris Rende*

TUTORIAL

310 **Ordered Chaos** A look at randomness. *Ken Webb*

UTILITY

* 196 **NEATLIST** For the Walter Mathaus among us. *D. N. Ewart*
200 **Array I/O** Fast data transfer of Basic data. *Norman Neff*
204 **Add CRC ASAP** Cyclical Redundancy Code for tape. *Roxton Baker*
217 **Does FORMAT get your BACKUP?** Stop raising your hackles over glitched disks. *W. D. Hart*
224 **Fill in the Blanks** Pack your records before committing them to tape. *Robert Schuldenfrei*
* 230 **Another Major Operation on Scripsit** Grafting it to a printer. *Lynn W. Graves*
* 240 **Tape Spate** Save and recover. *Bill Bowman*
* 304 **Lost in Basic** Variables are where you find them. *Mark C. Paxton*

DEPARTMENTS

6 **Proof Notes**
8 **Remarks** *Wayne Green*
10 **80 Input**
28 **80 Accounting** *Michael Tannenbaum*
30 **Soft Bits** *Roger Fuller*
36 **Reviews**
52 **Exclusive Oracle** *Dennis Kitsz*
56 **Kitchen Table Software** *David Busch*
328 **News**
342 **80 Applications** *Dennis Kitsz*
364 **Education 80** *Earl R. Savage*
366 **Notes From Beneath the Keyboard** *Paul Weiner*
376 **Input/Output** *Jim Keogh*
382 **New Products**
391 **Calendar**
392 **Reload 80**
403 **Reader Service**

* = program is on Reload 80 tape.

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DESIGN CONSULTANTS: Invisible Inc.
Elaine Cheever, Corporate Designer
Denzel Dyer, Howard Happ, Laurie MacMillan, Joyce Pillarella, Diana Shonk, Susan Stevens

PHOTOGRAPHY
William Heydolph, Paul Babich, Sandra Dukette, Brian Hastings, Thomas Villeneuve

TYPESETTING
Sara Bedell, Debbie Davidson, Michele DesRochers, David Hayward, Stephen Jewett, Ann Lord, Kelly Smith, Karen Stewart

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Cover and Buyer's Guide Cover by William Giese

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Proof Notes
the editors look at the issues

This issue marks the beginning of *80 Microcomputing's* third year. We've changed a lot from our 146 page beginning; along the way we've made many new friends.

Roger Fuller, author of SuperMap, premiered his new column, "SoftBits," in last month's issue. Roger will explore Assembly language, helping Basic programmers on the way to faster program execution and elegant assembly applications. Roger has much experience using and teaching the language; he's been busy in Texas, his home state, teaching Assembly language programming classes in his spare time.

Paul Weiner, master bit-bucket emptier, intends to favor us with his own brand of wit and wisdom in an occasional column called "Notes From Beneath the Keyboard." Paul, one of the original cosmic wanderers, has recently turned freelance, and is anxious to share his wanderings with like-minded programmers.

Bruce Douglass, professor of physiology at the University of South Dakota, will present us with math and science applications in "Mathematica Copernica," (coming next month). Judging from Bruce's qualifications and interests, we're going to be in for a treat.

Jim Keogh has answers for any questions you have about the industry, hardware, software, you name it. Challenge him in "Input/Output."

We hope to begin a new column on medical applications, which will premier in a future issue. Several surprises are also planned for the coming year—keep your eyes open.

You may notice a few changes in the look of *80* developing over the next few months. The Key Box will accompany articles with programs. The information in this box will give you a brief run-down on the program featured in each article—what model is called for, how much memory is needed, necessary peripherals, and so on. We also hope to give you more information about our authors—look for a bio line following each article to discover who your fellow TRS-80 users are.

Load 80 subscribers will be pleased to find the Load 80 logo on the title page of each article featured on that month's cassette or disk (which are available beginning this month).

We have redesigned our layout to make the magazine easier to read. Some of our regular columns will be found in the back of the magazine, placing feature articles closer to the front. Some of our pages are getting a facelift. We hope you like the changes—we'll look forward to your comments.

This page, as well, is a new feature. On this page the coordinating staff editors and I will present you with an overview of the issue, our thoughts on the feature topic of the month, and comment on other developments that occur in the field of micros. We want our readers to get to know us, and we want to address the topics which will concern you, as computer users.

The box at the bottom of this page contains information that will help you use *80* and the programs we publish more effectively.

Videotext is the generic term for a network system linked by telephone, cable tv or fiber optics lines. It is designed to bring news, games, mail, bulletin boards—you name it—into your home from one or more data bases, via your television or micro's video screen. The best known videotext system in this country is Radio Shack's own Videotex.

Radio Shack isn't the only group to develop and market a publicly-available network system. Among others, the French have one called Telematique, the British have Prestel, and the Canadians have Telidon. By all reports, these and other systems make Radio Shack's Videotex look obsolete. Is it true? Two of our staff writers have spent many hours finding out.

Mike Nadeau looks at Radio Shack's system in "Videotex for the Masses." He tells what Videotex is and isn't, and stacks some of the other systems up against it.

Bert Latamore provides an in-depth report of the Canadian system (see "A Terminal Case"). Telidon is an experimental system which has proved several networking theories and left others still to be explored. It is also doubling as an experiment in the use of fiber optics as a transmission method, a concept which could revolutionize communications.

Another feature you won't want to miss is our Buyers Guide to Disk Drives. News Editor John Mello has compiled all the information you need to get your money's worth when you finally get the bucks together to buy some drives. You may have to live with them a long time, so it's important to buy right, and we can help you.

The special business section in this issue is—you guessed it—all the articles which wouldn't fit into our annual business issue. Business applications have burgeoned over the last year, as our bulging mailboxes attest. You'll find a number of useful articles in this section.

Happy New Year!

Debra Marshall
Managing Editor

The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *80 Microcomputing*, you should make this change.

80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Readers should note the article on page 290 of the October issue incorrectly received the same title as another article in that issue by the same author. Mr. Blechman has pointed out that the correct title appeared on the contents page. The mistitled article is a discussion of the differences between the Model I and III computers, which should interest many of our readers. We apologize for the confusion.

Have a hardware and software background? Interested in a publishing career? Send a resume and cover letter to the editors of *80* c/o this magazine.

Reader Service for facing page ↙357→

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80 REMARKS

by Wayne Green

". . . a panic swept through the Tandy Towers at the growing number of game systems. . ."

Color Fading?

A couple of Radio Shack dealers have mentioned the recurring rumor that Radio Shack is planning to phase out their Color Computer. I have not called the factory about this because if it is true they will probably deny it. If it is false they will also deny it. So why waste money on the phone call?

From a practical point of view, it seems a likely move. The color system seems to have been added to the line of computers more in response to the raft of inexpensive color game systems than as a serious computer. It appears that panic swept through the Tandy towers at the growing number of available color game systems, such as the APF, Atari, Bally, Mattel, VIC, Odyssey and so on.

Radio Shack, large as it is, has been unable to really keep up with the computer market. Their program support of their best-selling systems has been marginal, to be kind about it. Just as the Model I was starting to take hold and a few fairly good programs emerged for it, they went to the Model II. The program support for that model is still way off somewhere, which has severely cut into the sales of that system, from all I see and hear.

When the FCC clamped down on the inexcusable radio interference generated by the Model I, Radio Shack brought out the Model III—but they made so many changes they lost much of the program support which had built up for the Model I. All this has kept them exceedingly busy . . . not to mention mounting problems in the effort to supply peripherals. Radio Shack does not appear to want to leave any crack open for outside support if they can help it.

With all that going on it is no wonder they ran out of people to develop support for the color system. To be fair, the demand for more programs for the Color Computer has probably been light. Since the system was promoted as a game computer—and has thus been perceived by most people as being just that and no more—it is unlikely there has been much demand for more than games.

The few hobbyists who bought the system discovered it has a great many possibilities yet to be made public. Tandy, which manages to publish about one percent of the information available about their computers, has had very little to say. Little, too, has reached the commercial magazines, which have been doing most of the promotion work for Tandy—with little thanks or cooperation.

I've asked in the past for articles on the color system. A few have come in, but considering the capabilities of the system, the lack of material is discouraging. This may turn out to be one of the undiscovered gems of microcomputing . . . brought out by Radio Shack, neglected, underadvertised, underdeveloped . . . and then phased into oblivion.

The people at Instant Software tell me the same. They have had very few programs submitted for the color system. Our reader polls tell us only a small percentage of our readers have the system, so not a lot of coverage is expected in *80*. But we would like to have *some*.

Radio Shack has to either fish or cut bait on the Color Computer. They are going to have to supply more software, information, peripherals and advertising, or forget it. They've ignored the pocket computer in the same way, which is also a pity. I frankly think they had the start of something important with that one and let it slip through their fingers. Unfortunately they may have brought down Sharp, Quasar and Panasonic with them. They were all getting started with similar units and, I suspect, looking to Radio Shack to help make the pocket computer idea popular. So far the Pocket Computer has been a bomb.■

When The TRS-80 Is Not Enough

While Radio Shack has been developing "Everyman's" computer system, other firms have been aiming at the next step up—computers which are designed for businesses in the half-million to ten-million dollar range. These firms have developed micros which are a serious threat to the much more expensive minicomputer systems. I'm thinking in terms of the Cromemco, Ohio Scientific, Midwest Scientific, Vector Graphic, and so on.

These systems, while able to handle substantially more work than the TRS system, still cost less than adding a person to the payroll, and can handle the workload of several bookkeepers. Even with accelerated depreciation and today's interest rates, a business can afford to buy a $22,500 computer system if it will do the work of just one person. When you start adding the other benefits, such as better service for customers, better financial records for management, and so on, the computer investment wins hands down.

The maxi-micro with which I'm most familiar is from Midwest Scientific Instrument. Unlike most micros, where the operating system and the applications programs have been retrofitted to the hardware, the MSI programs have been designed as a part of the whole system by the manufacturer.

As we work with our TRS-80s we come to appreciate the remarkable things they can do for us, and to be frustrated by their limitations. They can do many of our smaller business tasks, but as the number of accounts grow, we really have to get a larger system. When you or your firm are in need of a heavier-duty computer, look into the bigger micros: they can probably handle it. I've been particularly impressed with the MSI system, which can support several terminals (micros, if you like) and use hard disks of almost any size.

The MSI system has a fine operating system and an integrated group of accounting programs which are the best of any I've seen. It is obvious these programs have been crafted by an expert accountant rather than a programmer with a bit of an accounting background. And MSI, still a relatively small firm, provides a degree of personal service which is heartening in this field. I wish some computer firms which are less than an hour's drive from us could do as well as MSI does from Kansas.■

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80 INPUT

"Why must a training center take the form of the traditional university or trade school?"

Green U

While it is my normal practice to "hole up" on my Iowa farm and enjoy the editorial hassles of media and periodical publications from afar, I am compelled to write to you. First of all, I very much enjoy and use *80 Microcomputing*. One small article in the first issue solved a problem for me and was worth the entire subscription price. Secondly, while I am not sure the competition is friendly, I have had several laughs over the battles you obviously have with Mr. David Ahl.

I agree completely with your analysis for the education needs outlined in recent editorials. As an owner of a TRS-80 for more than two years I know a great deal about the ignorance and incompetence found in many so-called computer stores. Farmers in our area have a real need for versatile, user-friendly software. But this is nothing in comparison with a need for literacy and user training. Your comments in the current *80* concerning computer training in emerging nations is also most relevant.

However, I would chide you on the concept of "Green U" in the New Hampshire mountains. One must be on guard against building monuments to one's ego.

Why must a training center take the form of the traditional university or trade school? Isn't the so-called Third Wave of the Industrial Revolution upon us? Isn't one of the concepts of this "Wave" increasing development of "cottage industry?" Why isn't this learning center being conceived around CAI, Satellite communications and utilization of data banks? These ideas might better enable you to reach more people, especially in emerging nations.

I am suggesting your idea is absolutely fantastic! Do not give up on it! You need to train people in "mid-career." Technical obsolescence of engineers and scientists trained 12 or more years ago is a fact. These people need updating also, but cannot afford (economically) to take a time-out for two years. Regional centers or use of earth stations (even cable tv) could enable these folks to participate in a new learning experience, but it needs to be available while they are still working.

Give 'em Hell, Wayne. We need more prophets in the world today.

Max E. Franck
Cedar Falls, IA

Wayne Replies

Well, Max, you have some good ideas. Indeed, I have something along the line of your suggestions in mind. . . but (always a but), it is going to be some time before our communications technology is equal to the job. In the meantime, we must start the type of education we are going to need so we will have something usable when the communications finally are ready.

The first step is being taken, as I mentioned in the editorial. I am working with Hawthorne College to set up a microcomputing degree course. I have in mind a blitz two year course which will include the fundamentals of electronics, the hardware design and service of most popular microcomputers, an introduction to all of the popular micro languages, with advanced Basic and machine languages, business courses in marketing, advertising, how to sell, how to write, business law and contracts, and so on. This would, in two hard years, result in an associate degree and probably the job of one's choice.

Those wanting to go on to a full degree course would also get extras like a ham license, flying instruction, skiing and a lot of practical experience in working professionally with on-campus businesses. They would work with all phases of publishing, writing of software, hardware design and manufacture, selling, advertising, and so on. I will write in more detail about this in my editorials as these courses develop.

You can bet we will be working toward extension courses via video cassettes, video disks, cable, satellite. . . or whatever comes along.—Wayne

Serial Printing

In regards to your article on serial printing with the Editor/Assembler Plus from Microsoft, the modification procedure shown in Table 1 may be of value to readers without the RSM monitor and extra memory.

The requirements for the change are: a 16K Level II machine; TRS232 formatter program and the Editor/Assembler Plus (version 1.06 or 1.07).

This procedure uses the Editor/Assembler to modify itself.

Michael Lau
Scarborough, Ontario

Switches and Sorts

This letter is prompted by the letter from William E. Jones, M.D., of Austin,

Step	Description
1	Load the Editor/Assembler and run
2	Using the same method as described in the September 1981 issue of *80 Microcomputing* create the file Newfor.
3	Enter Zbug and make the following changes: Address From To 4459H DD OR E8 02 445AH 71 74 4461H 3B 81 4462H 00 72
4	Press the reset button to get back to Basic.
5	Enter system
6	Load the Newfor object code into the computer.
7	When that is done get back into the editor and clear the text buffer by /1728.
8	Get into Zbug and save this new version of the Assembler/Editor by typing: 4380 7402 4380 EDTASM$P

Table 1.

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Texas (Garbage Sorts, *80 Input*, August 1981). Assuming Dr. Jones is simply sorting strings and not rearranging the format, it sounds like he is using A$ = B$: B$ = C$:C$ = A$ switches on his sorts. This has the infuriating habit of stalling. The following switch, however, does not hang up:

```
FORK = 0 TO 2:B = PEEK(VARPTR(A$(X)) + K):POKE
VARPTR(A$(X)) + K,PEEK  (VARPTR(A$(Y)) + K);POKE
VARPTR(A$(Y)) + K,B: NEXTK
```

A similar arrangement probably could be fitted to the Model II. Using a shell sort, this will do about 400 strings in 3-5 minutes.

The problem does not arise for numerics. By changing the range of the For . . . Next loop the switch could be adapted to fit the type of variable in use.

Keiron Clark
Toronto, Ontario

Shipping Charges

I ordered KEEPIT 3.0 utility as advertised in *80 Microcomputing* from The Alternate Source. The advertisement states that to get your copy send just $9.95 and your name and address. The tape arrived with an invoice for $2 shipping charges which they advised me to pay promptly. Clearly their advertisement is misleading.

Incidents like the above would tend to make one hesistant to order software by mail from the pages of your fine magazine. I assume this type of business practice is not widespread.

Michael E. Ellis
East Moline, IL

The Alternate Source Responds

Our policy, as indicated by most of our ads, is to charge $2 for shipping. Unfortunately for both you and me (and 80 Microcomputing*), postage is an ever-mounting expense. KEEPIT was specially priced to give users a very good software value for hard-earned dollars. You will see better programs appear, but few, if any, as good a value. I doubt we will be able to bring out many more at that price. We charge a "medium" range for postage. A quick scan through* 80 Microcomputing *show companies charging $2.50 or even $3 for the same service. But that still does not solve your problem.*

While most of our ads include the request for $2.00 postage, we did slip on that one. You are under no obligation to respond to the invoice. The merchandise was offered at a certain price. I agree, good business is not conducted in that manner. I trust you observed we did not detain your order one minute because of the discrepancy in funds. Also, please notice you have not been invoiced or harrassed in any manner (nor has anyone else). We let the customer know of the expense in getting the product to him promptly, ask for it once and then mark the expense off as a lesson learned.

I hope you have not been inconvenienced in this matter and that this has not detracted you from your enjoyment of KEEPIT in any way. If you have any problems with the program (or any product from TAS) rest assured you will receive the same service as someone who purchased the program at any price.

Thank you for keeping us on our toes.

Charley Butler
The Alternate Source
Lansing, MI

Mod II Title Graphics

Since my Title Graphics article appeared in the September 1981 issue of *80 Microcomputing*, I have received requests for Model II operable program conversions.

The PRINT@ values in the article's program listings are for a Model I or III. These models have 64 by 16 screen layouts with 1024 specific character display locations. A Model II has an 80 by 24 screen layout with PRINT@ locations numbered from zero at the screen's upper left corner to 1919 at its lower right corner.

Used in a program, PRINT@ displays a character at (or string of characters starting at) a specific location on the screen. PRINT@39,"*";, for example, displays an asterisk at the center of the Model II's top line. Similarly, PRINT@1879,"*";: displays an asterisk at the center of the bottom line. A Model I or III do the same things, but with PRINT@31, and PRINT@991, respectively.

These screen layout and PRINT@ value differences skew and scatter the Title Graphics program displays over the upper 3/5ths of the Model II screen. You must change the program's PRINT@ values to make them operable on a Model II. See the Video Display Work Sheet in your Model II Reference Manual for display line starting and ending PRINT@ values. Program Listing 1 is a Model II conversion of the article's Program Listing 1a. All PRINT@ values have been changed to provide Model II graphic titles resembling those shown in the article's Fig. 1 through Fig. 3, and in Photo 1. Also, variation four's graphic character ASCII code has been changed from 132 to 145 for a closer dupli-

```
0 CLS: CLEAR75: GOSUB65508: FORU=1TO1999: NEXT: CLEAR50
1 GOTO1:'(DELETE THIS STATEMENT WHEN TITLING A PROGRAM)
65508 B$="BANG*":            '(VARIATION 1, SEE FIG. 1)
65510 FORU=0TO80STEP5: PRINT@U,B$: NEXT
65512 FORU=136TO1675STEP81: PRINT@U,B$+B$+B$+B$+B$+B$;:
      NEXT
65514 FORU=1756TO1836STEP5: PRINT@U,B$;: NEXT:
      FORI=1TO200: NEXT
65516 FORU=126TO1706STEP79: PRINT@U,"DUCK HUNT";
65518 FORI=1TO9: NEXTI,U
65520 PRINT@1867,"TITLE GRAPHICS BY KAL";
65521 PRINT@1840," ";: PRINT@734," ";: RETURN
65522 '(STATEMENT CHANGES FOR VARIATION 2,  SEE FIG. 2)
      '65508 B$="%%%%%":
      '65516 FORU=1712TO112STEP-80: PRINT@U,"SHOOTING
             GALLERY";
65524 '(STATEMENT CHANGES FOR VARIATION 3,  SEE FIG. 3)
      '65508 B$="DOWN"+CHR$(161):
      '65516 FORU=100TO1720STEP65: PRINT@U,"PARACHUTE
             JUMP CONTEST";
65526 '(STATEMENT CHANGES FOR VARIATION 4, SEE PHOTO 1)
      '65508 B$=STRING$(5,145):   '(USE ANY ASCII CODE)
      '65516 FORU=109TO1709STEP80: PRINT@U,"GRAPHIC
             CHARACTER TITLE";
```

Program Listing 1.

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  - Example: Select records representing those sales made to XYZ COMPANY that exceed $25.00, between the dates 03/15 and 04/10.

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cation of the Photo 1 display.

Here are some statement 65516 adjustments for title lengths which may differ from Program Listing 1 title lengths.

Variation 1 can handle a title up to nine characters long. Add 1 to 126 and to 1706 for every two characters less than nine in your title.

Variation 2 can handle a title up to 27 characters long. Subtract 1 from 1712 and from 112 for every two characters more than 16; add 1 to 1712 and 112 for every two characters less than 16 (the length of "Shooting Gallery").

Variation 3 can handle a title up to 43 characters long. Subtract 1 from 100 and from 1720 for every two characters more than 22; add 1 to 100 and 1720 for every two characters less than 22.

Variation 4 can handle a title up to 27 characters long. Subtract 1 from 109 and from 1709 for every two characters more than 23; add 1 to 109 and 1709 for every two characters less than 23.

Because of its limited graphic character repertoire, the Model II cannot exactly duplicate the graphic titles shown in the article's photos. While Models I and III have 64 graphic characters which can be combined into any conceivable shape, the Model II has only 31. The latter characters (128-158) are shown on page four of Appendix B in the Model II Reference Manual. They appear to be designed strictly for lined graphs and charts. But, the graphic characters' ASCII codes can be substituted in the Title Graphics programs, as well as any other displayable characters shown in Appendix B.

Program Listing 2 is a Model II operable conversion of the article's Listing 5 and Photo 5 Wedge Title. Howard 'Doc' Reed of Yakima, WA made the conversion and provided the copy. He replaced graphic character 149 with Model II's 148 to match the vertical lines of the article's photo 5. I adjusted some of his PRINT@ values to heighten the display four more lines.

Francis S. Kalinowski
Orlando, FL

```
0 CLS: CLEAR150: GOSUB65512: CLEAR50:     '(SEE PHOTO 5)
1 GOTO1:'(DELETE THIS STATEMENT WHEN TITLING A PROGRAM)
65512 Y=158: X=6: Z$=CHR$(148)
65516 PRINT@0,STRING$(82,Z$);
65518 PRINT@Y,STRING$(X,Z$);: Y=Y+78: X=X+4
65520 IF X<78 GOTO65518 ELSE PRINT@Y,STRING$(120,Z$);
65522 PRINT@271,"TITLE GRAPHICS";:   '(FIRST TITLE LINE)
65526 FORU=1TO1999: NEXT: RETURN
```

Program Listing 2.

Software Giveaway

I am responding to your request for information about Radio Shack salesmen giving away bootleg copies of other companies' software (*80 Input*, September 1981).

When I bought my TRS-80 in 1978, the salesman (manager?) not wanting me to leave with just Blackjack/Backgammon, made a copy of a so-so version of Space Trek and gave it to me. I had not asked for it, and in fact, didn't even know he had it. I had thought, until yesterday when I read your magazine, that this was an isolated incident.

On the other hand, a friend of mine who just bought his Model III this month from a computer store, wasn't offered or given anything he didn't pay for.

I look forward to reading the results of your casual poll in a future issue of *80 Microcomputing*.

Michael Welte
Burbank, CA

Call for Integrity

Custom Tailored Software has been writing programs for the TRS-80 since 4K Level Is were the state of the art. I can testify that when disk systems were first introduced Radio Shack tech representatives were passing out bootleg copies of NEWDOS like candy since TRSDOS was not working. I can understand that they had to do this to avoid being buried under returned hardware, but it was stealing pure and simple. Custom Tailored Software bought its own copy and insisted its clients do the same.

Ed Juge believes only "several people" did not follow the rules. I can assure him, from conversations I have had with other TRS-80 users across the country, this practice was widespread, more the rule than the exception. The caliber of Radio Shack's computer people has improved markedly in the past two years. However I have been offered "bribes" of free copies of Radio Shack and other companies' software if I would get a potential customer to buy a computer from a given manager's store. I understand Tandy does not approve this conduct, but they must understand that their managers are under tremendous pressure to make sales and will do what they think is required to move the equipment. Radio Shack would do well to stress integrity as well as selling techniques in their marketing training.

Frederick E. Kreiss
V.P. Program Development
Custom Tailored Software Inc.
East Orange, NJ

Buy for Less

My recent experience with a memory upgrade for my Model III has raised some questions regarding Radio Shack's pricing levels for this service. Recently Radio Shack reduced their catalog price for a 16K upgrade to $99 plus installation—the latter quoted at $15-25 by a local salesperson. Total costs for expansion from 16K to 48K would therefore range between $230 and $250.

Faced with this steep price I contacted one of your advertisers who listed 16K upgrade kits at $19.95. I was assured the chips used in the kits were of prime manufacture, equivalent to original equipment and full instructions were provided for easy installation. I invested $39.90 for two kits and $6.95 for a recommended IC insertion/extraction tool. The chips proved to be exactly as advertised and although I have had no significant prior electronics experience, my system was up and running at 48K in about a half-hour.

I am a believer in fair and adequate profits but, as you have repeatedly noted in your publication, it appears that substantial equipment savings are possible for the careful buyer.

Ronald R. Ostromecki
Osmego, NY

The following letter is addressed to Jon Shirley, Vice President Computer Merchandising, Tandy/Radio Shack.—Eds.

Brand X Betters Radio Shack

It is October and I have finally received my September issue of *TRS-80 Microcomputer News*, Radio Shack's newsletter for TRS-80 owners. After numerous phone calls from our customers about your warn-

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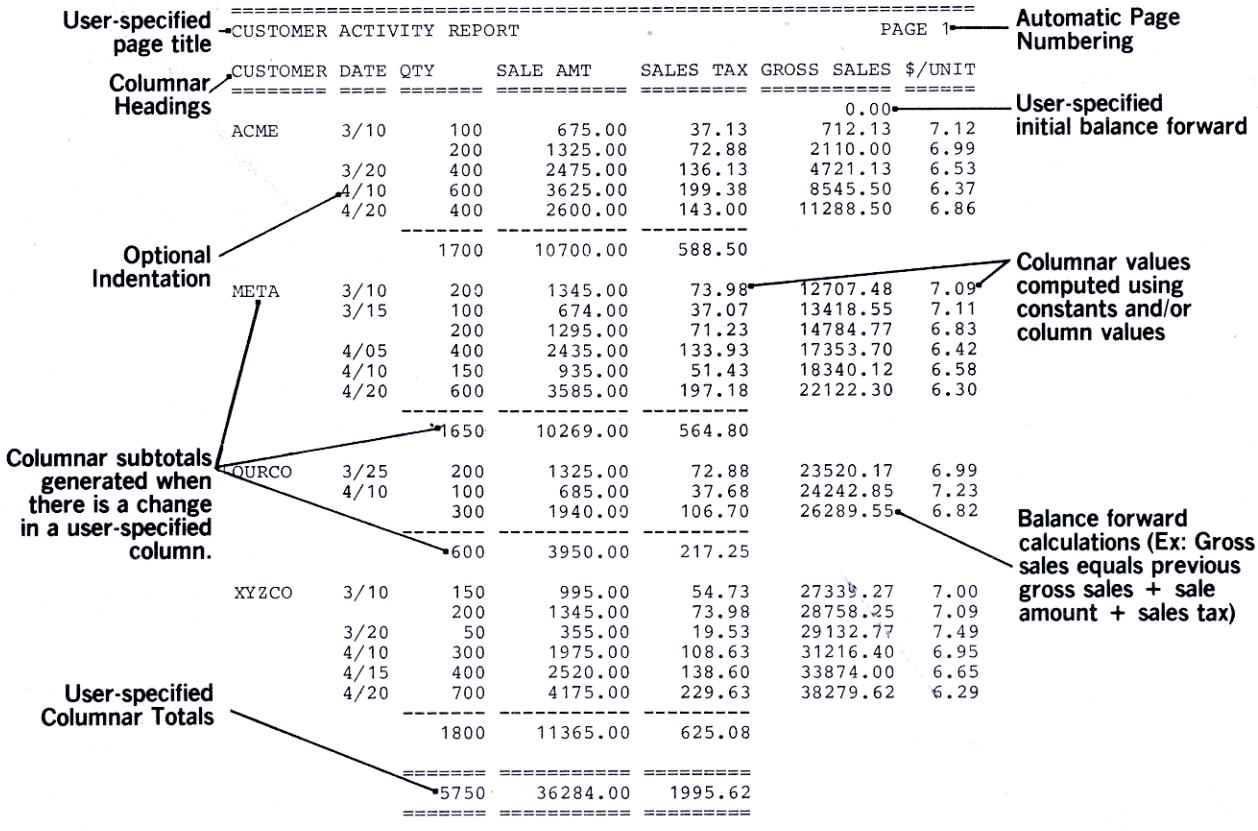


```
CUSTOMER ACTIVITY REPORT                                    PAGE 1

CUSTOMER  DATE  QTY      SALE AMT     SALES TAX  GROSS SALES  $/UNIT
========  ====  =======  ===========  =========  ===========  ======
                                                       0.00
ACME      3/10      100       675.00      37.13       712.13    7.12
                    200      1325.00      72.88      2110.00    6.99
          3/20      400      2475.00     136.13      4721.13    6.53
          4/10      600      3625.00     199.38      8545.50    6.37
          4/20      400      2600.00     143.00     11288.50    6.86
                -------  -----------  ---------
                   1700     10700.00     588.50

META      3/10      200      1345.00      73.98     12707.48    7.09
          3/15      100       674.00      37.07     13418.55    7.11
                    200      1295.00      71.23     14784.77    6.83
          4/05      400      2435.00     133.93     17353.70    6.42
          4/10      150       935.00      51.43     18340.12    6.58
          4/20      600      3585.00     197.18     22122.30    6.30
                -------  -----------  ---------
                   1650     10269.00     564.80

OURCO     3/25      200      1325.00      72.88     23520.17    6.99
          4/10      100       685.00      37.68     24242.85    7.23
                    300      1940.00     106.70     26289.55    6.82
                -------  -----------  ---------
                    600      3950.00     217.25

XYZCO     3/10      150       995.00      54.73     27339.27    7.00
                    200      1345.00      73.98     28758.25    7.09
          3/20       50       355.00      19.53     29132.77    7.49
          4/10      300      1975.00     108.63     31216.40    6.95
          4/15      400      2520.00     138.60     33874.00    6.65
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                   1800     11365.00     625.08

                =======  ===========  =========
                   5750     36284.00    1995.62
                =======  ===========  =========
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ing relating to an article on "Caveat Emptor" attitude toward third party manufacturers and retailers, we at VR Data must take exception. We agree with Wayne Green, publisher of *80 Microcomputing* and other fine magazines, that tremendous savings can be had without any sacrifice in quality. VR Data and a number of other manufacturers of compatible hardware and software products have given growth not only to their own companies but also have given many people, more reason to buy the initial Radio Shack system. Many customers could have never afforded a disk system for their TRS-80 if the "Brand X" disk drives had not been available at prices well below the Radio Shack list.

The economy of the late 1970s and 1980s has prompted much belt tightening from the major corporations down to individuals.

When buying products directly from the small manufacturer/retailer, the customer does not pay for three or four separate profit centers, (manufacturing, national warehousing, area warehousing and retail stores) and high priced executive salaries and offices. Smaller businesses do not have the extra expense of the middle profits. Therefore, it is conceivable to have high quality, low cost products available.

In relation to support on our own product line, VR Data designed their Disk III modularly. Problems can be easily isolated over the phone and immediate replacement parts can be sent to the user directly if he is not located near one of our dealers.

We do not expect Radio Shack to repair our "Brand X" disk drives or controllers. We designed them to be troubleshot by the neophyte.

As to the question of who is going to install the disk drives in the machine—the user, of course. We have received letters from customers saying the instructions were so well written their children were able to do the installation of the Disk III.

We at VR Data are proud that most of our business is from referrals, even some from Radio Shack Stores. We are well known for our computer literacy relating to TRS-80 and helping no matter where the TRS-80 owner bought the machine.

As you well know, pricing is not the only thing that sells our product. If we did not support our products, we would not be able to stay in business.

We sincerely hope you will retract some of your harsh anti-competition statements.

Warren G. Rosenkranz
President
VR Data Corp.
Folcroft, PA 19032

```
1     '*** FROM 80 MICROCOMPUTING OCT '81, PAGE 374
5     '*** THIS PROGRAM WILL ONLY WORK WITH PROGRAMS SAVED UNDER THE ASCII FORMAT
(SAVE 'FILENAME',A)
6     '*** SP = LOCATION OF SPACE SEPARATOR BETWEEN LINE NUMBER AND TEXT TS = BEGINNING
OF STATEMENT TEXT TL = LENGTH OF STATEMENT LINE NL = NUMBER OF FULL PT LINES
EC = NUMBER OF CHARACTERS OF LAST LINE IF LESS THAN PT
10    CLS:CLEAR 5000:PN =
20    POKE 16425,1:PT = 100:IN = 5:' *** 'PT' = LENGTH OF PRINTED STATEMENT TEXT LINE AND
'IN' = LEFT MARGIN
1000 INPUT"ENTER TODAY'S DATE (MM/DD/YY)";A$:' *** IF LEFT$(TIME$,2) = "00" THEN INPUT "ENTER
TODAYS DATE (MM/DD/YY)";A$:IF LEN(A$) = "DATE " + A$:CMD"A$"
1010 CLS:INPUT"FILE NAME";FL$
1020 OPEN "I",1,FL$
1030 SL = INSTR(FL$,"/") - 1:IF SL< 1 THEN SL = LEN(FL$):' *** SEARCHES FILE NAME FOR A '/' AND DIS-
CARDS EVERYTHING TO THE RIGHT.
1040 LPRINT   CHR$(27);CHR$(19);CHR$(27);CHR$(14);TAB(19);LEFT$(FL$,SL);CHR$(27);CHR$(15);TAB(42);
"DATE: ";A$;LPRINT CHR$(138):' *** PRINTS HEADER
1050 LPRINT CHR$(138):LPRINT CHR$(27);CHR$(20);TAB(60);"' PAGE ";PN;" *":LPRINTCHR$(138):
LPRINT CHR$(138):' *** TURNS ON 16.7 CPI MODE AND PRINTS PAGE NUMBER. ALSO PRINTS PAGE
NUMBER.
1060 IF EOF(1) LPRINT CHR$(27);CHR$(19);CHR$(11):CLOSE:PRINT:PRINT"' TERMINATED *":END:' ***
SETS PRINTER TO 10 CPI
1070 LINE INPUT#1,A:' *** REQUIRED FORM FOR INPUTTING ASCII FORMATTED PROGRAM FILES
1080 SP = INSTR(A$," "):TS = SP + :TL = LEN(A$) - SP:NL = INT(TL/PT):EC = TL - NL*PT
1090 FOR N = TS TO LEN(A$)
1100 IF MID$(A$,N,1) = CHR$(10) THEN MID$(A$,N,1)= CHR$(94)
1110 NEXT
1120 LPRINT TAB(IN);LEFT$(A$,SP);
1125 '*** LINES 1130 TO 1170 PERFORM ACTUAL FEEDING AND PRINTING
1130 IF NL = 0 AND EC = 0 THEN LPRINT CHR$(138):GOTO 1170
1140 IF NL = 0 LPRINT TAB(IN + 8);MID$(A$,TS,EC):LPRINT CHR$(138):GOTO 1170
1150 LPRINT TAB(IN + 8);MID$(A$,TS,PT)
1160 TS = TS + PT:NL = NL - :GOTO 1130
1170 IF PEEK(16425)> 55 THEN LPRINT CHR$(11):PN = PN + 1:GOTO 1050
1180 GOTO 1060
```

Program Listing 3.

Listprog Improved

At my wife's insistence I purchased a used Model I Level 1 4K in May 1980. Since then personal computing has become a passion with me. Now, with a Level II 48K DOS, printer, and much time and money for books and magazines, I can honestly say *80 Microcomputing* is the best bargain I have ever seen. Frequently I will think of something I would like to do or learn and I normally find it in your magazine.

The most recent issue contained an article ("Listprog" *80 Microcomputing*, October 1981) on listing programs with double spacing between lines. Perfect!

I made a few modifications to the program (Program Listing 3) that allow the use of typing paper by inserting a pause between page prints. The remarks should provide enough explanation.

One other item. In one of your recent issues you asked for inputs on Radio Shack dealers providing illegal copies of software. I have been given free copies of only Radio Shack programs. Further, I have given copies of Radio Shack programs to their own employees as training aids.

Thanks for a terrific magazine.

Michael J. Nicholson
K.I. Sawyer, AFB, MI

Broker Not Bungled

I am writing this letter in response to the "Bungled Broker" letter which appeared in *80 Input* (October 1981). This letter contained a list of "serious mistakes" which the writer of the letter found in my June 1981 programs ("The Software Broker"). I shall answer the complaints as best as I can.

Complaint 1: Update/DTA line 1420 contains the "glaring" mistake FOR P39 = 1 TO 80. This is not a mistake! The Update/DTA program does not contain a line 1420. I believe the person was referring to the Forecast/MKT program. This program contains the following line:

```
1420 FOR P39 = 1 TO 80:LPRINT"*":NEXT
```

This is exactly as it is supposed to be. I do not understand why you think this is a mistake!

Complaint 2: Lines 170, 180, and 190 of the Stock/ANA program. The person says the formulas are incorrect and offers his solution. The formulas are correct as pub-

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80 AID

Break Address Wanted

We were interested in Tom Yager's article (June 1981, p. 197) on the Model II. Specifically, we were pleased to learn that one can return to Basic by branching to 2800H. However, this does not set the break interrupt address to Basic's break handler. Consequently, any use of the Break key thereafter in Basic returns to TRSDOS.

A partial solution is to arrange for breaks to return to Basic at 2800H, by using SVC #3 when returning. Augment Tom's jump instruction as shown in Program Listing 1.

The trouble with this approach is you still cannot use the Break key to halt execution in Basic and subsequently continue by using Continue.

Could someone supply the address of the break handling routine in the Basic interpreter supplied with TRSDOS 2.0?

Gerald Lippey
The Lippey Company
201 South Dundy Drive
Los Angeles, CA 90049

Assembly Language Subroutines

Do your readers know where I could obtain a compilation of assembly language subroutines to perform common tasks? For example, it would save me a lot of programming time if I had a set of mathematical functions subroutines in assembly language corresponding to SIN(x), RND(x), X↑↑Y, and so forth.

If no such compilation exists, I would appreciate hearing from individuals who might have various subroutines I could use.

James P.May
Associate Professor
of Geology and Chemistry
The Citadel
Charleston, SC

Keep watching these pages! We have exactly what you ask for. . . coming soon.—Eds.

Relocate Debug?

I recently purchased Radio Shack's new cassette monitor, Debug. Unfortunately, it loads into the addresses 4332H-493FH, overwriting the Editor/Assembler. Initial attempts to relocate it using the LDIR instruction (or machine code which used it) failed because of the absolute jumps inside Debug's machine code which needed to be changed. I tried changing some of the 43H-49H values in memory, because I thought they were the high-order bytes of the addresses of the jumps. This did not work, some of the values I changed were instructions. I looked at the article "Get T-Bug High," but the suggestions only applied to T-Bug. Debug is a different program.

If anyone has any idea of how to relocate Debug, I would like to hear from them. I am sure there are others with this problem.

Incidentally, is there any way to relocate the Editor/Assembler?

Evan Brody
159 Fields Avenue
Staten Island, NY 10314

Protected Disks

I recently bought a Model III two disk microcomputer. Originally I had owned a Model I and had accumulated a great deal of software for it including games, business programs, and utilities of all kinds. About 70 percent of my software is in Basic, but the other 30 percent is in machine language. However, most good software is in machine language. To Radio Shack's credit, a good portion converted properly.

The problem is, I have a few protected disks. Is there a way to boot these protected disks on a Model III? Will DOSPLUS work? Will OS-80 III work? Will NEWDOS 80?

Edward Savin
42 Morehouse Road
Easton, CT

Mod III Disk Failure

I wonder if anyone can help with a chronic Model III problem. A Model III I purchased in April failed after less than one hour of use! I exchanged it for a machine which did not work at all. I tested five machines, straight from the box, before finding one that worked. That machine failed after six weeks. There was another exchange which lasted out the warranty until July.

In all cases the second drive (:1) fails. The symptoms begin with a failure to properly format disks, yielding say "5 flawed tracks." (This failure holds for both Radio Shack and Verbatim disks.) Write operations on the drive became progressively slower until the machine hung in an endless

Continued on page 20.

```
        LD      HL,0
        LD      A,3
        RST     8           Removes previous break handler address.
        LD      HL,BRK
        LD      A,3
        RST     8           Sets new address to BRK.
        JP      2800H       Tom's branch to Basic.
BRK     *LD     HL,2800H
        PUSH    HL
        RET                 Returns to Basic on break.
```

*Destroying the contents of HL does not appear to cause difficulty when returning to Basic at 2800H.

Program Listing 1.

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80 AID

Continued from page 18.

disk operation.

I have talked to my local Radio Shack store, the Glendale Computer Center and the Texas hot line. Glendale suggested a sector sense LED was out of registration. Texas said Glendale was definitely wrong—perhaps the chimney required a foil lining. With an accusatory tone, Texas wondered what I was doing to their machine. I opened the case and found the LED incapable of being repositioned and the chimney already lined with foil. I soldered the several crimped ground wires for the second drive and got the machine running until now. Today the drive failed during an update operation on my master distribution disk destroying the directory.

I cannot believe I am the only one so afflicted—what can be done? I appreciate any help anyone can give.

Allen Ashley
395 Sierra Madre Villa
Pasedena, CA 91107

Line Spacing

I have a Radio Shack Model II, a Daisy Wheel II Printer and Scripsit. I use this system for preparing patent applications.

I file U.S. patent applications directly from my system, however for foreign filing it is a requirement that the applications be typed at a line spacing of one and a half (1.5), and the lines numbered at every fifth line. I do not know how to get my system to comply with this format and would appreciate any suggestions from you or your readers.

Michael J. Weins
3 Humphrey
Convent Station, NJ 07961

Speech Synthesizer Aid

As the father of a profoundly deaf 11 year old daughter and the owner of a 32K Model I with two disk drives, I am interested in any experience readers

"I cannot believe I am the only one so afflicted."

may have had with speech synthesizers. What I have in mind is a device where my daughter can practice words and the Video Display Unit will show her what she is saying. Has such a device been invented yet? Any other applications for assisting the deaf with speech would be appreciated.

Norman G. Fisher
104 Glover Street
Cremorn, N.S.W. 2088
Australia

Color Aid

Does anyone know of a software program that will allow me to use a TRS-80 Line Printer VII in conjunction with my Modem and 16K Extended Color Computer?

How about a decent Adventure/Labyrinth/Deathmaze type game for a 16K Extended Color Computer? Ideally the game would have graphics, but at this point I'd purchase a really good game without graphics.

Fred Weissman
34 Chiswick Road
Brookline, MA 02146

Missing Rail

I really liked your game Formula 80, and since I really don't like typing in programs, I like the shortness of it. But the left rail doesn't move from the left edge of the screen, so you have to guess where the invisible rail is. I searched my listing and I couldn't find an error, but again, I'm a novice so I could have missed something. I can't stand not knowing what's wrong.

Nick Shue
13910 Hough Road
Berville, MI 48002

Continued from page 16.

lished. The alternative solution will not work!

I believe the confusion is caused by the bracket symbol in these equations. The Line Printer II substitutes this symbol for the up arrow (the Level II TRS-80 symbol for exponentiation). When you type the programs, replace the bracket with the up arrow.

Complaint 3: In the Breadth/MKT program there is a mistake in the establishment of the value of L. If there is a mistake, I cannot find it. If the person will explain the mistake, I will be glad to respond in more detail.

Complaint 4: The Trading/VOL program produces nothing but a series of #'s and +'s. Correct! The program uses these symbols to construct the graphs.

Complaint 5: The person wrote, "I am sure there are other mistakes, but I have to get past these first."

Correct again! There is a mistake in the Moving/AVE program. My correction for this error appears in the same issue as his letter (October 1981).

Complaint 6: I wish these programs were tested before being published.

They were!

John Harper
Lawrenceburg, IN

Superhost Modifications

I am contributing the following modifications for Superhost (by Clayton Schneider) to run under DOSPLUS 3.3D (by Micro Systems Software) on the TRS-80 Model I 48K only:

First, using DOSPLUS Backup utility, create a copy of the original DOSPLUS system disk, then put the original away in a safe place. Use *only* the copy for these changes!

Second, copy the Superhost files H48/CMD, HOST48/BAS, INIT/CMD, SETUP/BAS to your DOSPLUS system disk. You do not need to copy any other files.

Third, run the SETUP/BAS program. When it asks for an operating system, select NEWDOS80, even though you will really be using DOSPLUS. Configure the rest however you desire.

Fourth, rename HOST48/BAS to H48/B with the DOS command: RENAME HOST-48/BAS:0 H48/B You must do this so you can make changes to INIT/CMD to allow it to work under DOSPLUS. The old name was too long for the required changes to fit into INIT/CMD.

Fifth, enter Basic without specifying

Continued on page 24.

Scanned by Ira Goldklang - www.trs-80.com

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MTC AIDS III

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any parameters. Then LOAD"H48/B" and add the line:

```
5 POKE &H404A,&HFB : POKE &H4049,0
: 'MEMSIZE = 64512
```

Then Save"H48/B" with the added line. DOSPLUS does *not* load &H404A and &H4049 with the memory size specified when entering Basic, but the H48/B (HOST48/BAS) program tests to see if it did, and apparently the location *must* contain the *user area* high memory size for Superhost to function correctly. You cannot simply remove the test in line 10 of H48/B. Superhost needs it for some reason.

Sixth, use the DOSPLUS Diskdump utility to change INIT/CMD. When Diskdump asks "Filename:" reply: INIT/CMD. Follow these instructions carefully:

a) Type the letter M (do not hit Enter).

b) Using the down-arrow move the big block cursor down to the row labeled "0000A0:"

c) Change this row (Do not hit Enter) from:

```
4241 5349 430D 0D0D 5255 4E22 484F 5354 BASIC
...RUN"HOST
```

to:

```
4241 5349 4320 4834 382F 422D 463A 332D BASIC
H48/B-F:3
```

(Notice that as you typed at the cursor, the ASCII portion of the display changed also. Be sure the hexadecimal part of the display matches exactly what is shown.)

d) Do not hit Enter yet. Using the cursor controls, put the cursor at the beginning

80 DEBUg

Shell Sort Fix

Dr. Michael Kirshner (Virgin Islands) has brought a bug to my attention which will cause the Shell Sort of my article ("All About Sorts—Part II" *80 Microcomputing*, September 1981) to list unsorted lists as sorted lists.

The patch to fix this bug is to delete all references to the variable name EE as follows:

```
1230 J = P
1260 T = A(J):
     A(J) = A(J + D):
     A(J + D) = T:
     J = J - D:
     E = E + 1
1360 D + INT ( D / 2 )
```

My thanks to Dr. Kirshner and my apologies to all who tried using this program.

Len Gorney
Box 91 RD 5
Clarks Summit, PA 18411

Startrek 4.0 Improvements

I typed in the Startrek 4.0 program by Jake Commander in the August 1981 issue. The game is enjoyable and challenging. A few small changes will improve it.

When you use the On Board Computer you may get a divide by zero error when you select the course calculator option. To fix this, modify line 3180 to read:

```
3180 ONERRORGOTO3190:CC = CC + ABS
(A)/ABS(X):GOTO3280
```

and add line 3190:

```
3190 RESUME3280
```

The course calculator will calculate too large distances, sometimes sending the Enterprise into a non-existent quadrant. The following changes will correct this:

Change line 3280 to read:

```
3280 PRINT@704, "COURSE = ";CC;:IFABS(X)>
ABS(A)THENCD = ABS(X)ELSECD = ABS(A)
```

Add line 3285:

```
3285 PRINT", DISTANCE = ";CD:GOTO2780
```

Donald M. Henderson
703 Flag Way
Kissimmee, FL 32741

Seasons Greetings Fix

After a summer lull, I am getting letters again about the Seasons Greetings program which appeared in the December 1980 issue of *80 Microcomputing*. Many people had trouble with the two main graphics routines beginning at lines 3000 and 5000. An increasing number of the letters are from Model III owners.

The most frequent difficulties seem to be incorrect numbers in the Data statements, or trying to run the 5000 routine alone, without reading the Data for the 3000 routine first.

The listing in the magazine is correct. I recommend careful proofreading of the Data as a remedy. If you want to run part of the program while you track down the bad Data, add the following two lines, and run the program from the beginning:

```
45   GOTO 3000
3900 GOTO 5000
```

I will send a list of other debugging hints if you send me a stamped addressed envelope.

I have run the program on a cassette-based 32K Model III computer. It runs well, except for a difference in the height-to-width ratio of the Model III and Model I CRT screens. As a result, the snowflakes and the moon in the snow scene may come out looking squashed on a Model III. Try the following changes to the program shown in Program Listing 1.

Valerie Vann
631 G Street
Davis, CA 95616

More About Sorts

My article "All About Sorts" Parts I and II contained some minor errors corrected in Program Listing 2.

Page 313 of the August 1981 issue did not list the Bubble Sort nor its sample output. The driver part of the program (lines 1000-1170) remain the same for all the listings.

Additionally, the sample output (Listing 5) should have been included as in Table 1.

Continued on page 26.

IT'S HERE . . . . .

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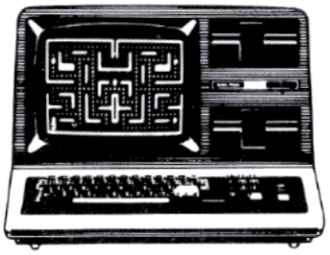

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80 DEBUg

Continued from page 24.

The September 1981 issue also contains a minor error in Part II of this article. Line numbers 1220-1240 are repeated twice in the Shellsort. This should not cause problems since both are the same. However, it does make for stuttering reading.

Len Gorney
Box 91 R.D. 5
Clarks Summit, PA 18411

```
ORIGINAL ITEMS   8 0 9 4 3 5 7 2 6 1
PASS # 1 ITEMS   0 8 1 9 4 3 5 7 2 6
PASS # 2 ITEMS   0 1 8 2 9 4 3 5 7 6
PASS # 3 ITEMS   0 1 2 8 3 9 4 5 6 7
PASS # 4 ITEMS   0 1 2 3 8 4 9 5 6 7
PASS # 5 ITEMS   0 1 2 3 4 8 5 9 6 7
PASS # 6 ITEMS   0 1 2 3 4 5 8 6 9 7
PASS # 7 ITEMS   0 1 2 3 4 5 6 8 7 9
PASS # 8 ITEMS   0 1 2 3 4 5 6 7 8 9
SPRTED ITEMS     0 1 2 3 4 5 6 7 8 9
COMPARISONS = 45 EXCHANGES = 27
```

Table 1.

```
2130  V = 100/48 (or something between that and 128/48; refer to the article)
5230  DATA 18,201,176,188,190,191,191,191,188,180,144,215
5240  OK
5250  DATA 24,200,170,191,191,191,191,191,191,191,191,191
5260  DATA 208,...   (Rest of line OK)
5270  DATA 26,194,129,198,131,143,175,191,191,191,143,135,
5280  DATA 129,...   (Rest of line OK)
```

Program Listing 1.

```
1180  '
        BUBBLESORT.
1190  FOR P = 1 TO N - 1
1200  '
        PUT N(TH) ITEM IN TEMPORARY STORAGE AND BEGIN TO BUBBLE UP THIS ITEM.
        FLAG F$ INITIALIZED TO NE EXCHANGES.
1210    T = A(N):
        F$ = "T":
1220  '
        BUBBLE-UP ASSUMES SMALLEST ITEM.
1230    FOR J = N TO P + 1 STEP - 1
1240      C = C + 1
1250      IF A(J - 1) <= T THEN A(J) = T:
                                T = A(J - 1)
                          ELSE A(J) = A(J - 1):
                                F$ = "F":
                                E = E + 1
1260    NEXT J
1270  '
        ITEM HAS BEEN BUBBLED UP TO ITS PROPER POSITION.
1280    A(P) = T
1290  '
        IF NO EXCHANGES TOOK PLACE, END ROUTINE.
1300    IF F$ = "F" THEN 1310
                    ELSE 1370
1310  '
        TAKE SNAPSHOTS.
1320    PRINT:
        PRINT"PASS #";P;"ITEMS   ";
1330    FOR KK = 1 TO N
1340      PRINT A(KK);
1350    NEXT KK:
        GOSUB 1170
1360  NEXT P
1370  RETURN
1380  END
```

Program Listing 2.

of line "0000B0:" and change this line from:

```
3438 2F42 4153 220D FF21 0000 2216 40E1 48/BAS
"..!..".@.
```

to:

```
4D3A 3634 3531 320D FF21 0000 2216 40E1 M:64512
..!..".@.
```

Once again, check to make sure everything is exactly correct. *Now* hit Enter. The changes have now been made to let INIT/CMD enter Basic and run H48/B with three file buffers open and a memory size of 64512 specified. INIT/CMD will now use the DOSPLUS command: Basic H48/B-F:3-M:64512 instead of the other, TRSDOS format which would not have opened files or set memory size under DOSPLUS.

Seventh, press Break to return to the "DOSPLUS is ready" message. Then enter the command AUTO INIT which will cause Superhost to come up after a reset unless you hold the Enter key during reset.

Eighth, put a write protect tab on this disk, make a copy of it and put it away with your Superhost original.

John C. Lord
Beltsville, MD

Video Twitch

I read with great interest the article by Marshall E. Smith concerning a video twitch problem (*80 Microcomputing*, October 1981). I have had this problem with my Model I Level II since it was upgraded to Level II. I called the hotline and was told the "mode select latch" was probably bad. I never bothered to return the unit for repairs because of the down time involved. I got around it by putting OUT255,0 in as many loops as possible. It is not a great solution, but it did the job fairly well. After reading Mr. Smith's article I searched my junk box of parts and found a 220pf ceramic disk capacitor. I soldered it in place and have not experienced any video twitching since. I know this capacitor is of a much greater value than the 27pf capacitor specified in the article, but it was that or nothing. After powering up the system, I observed the capacitor and the circuit traces in the area of Z49 and Z50 for any overheating. No snap. No crackle. No pop. No components overheating. My thanks to Mr. Smith for curing a problem Radio Shack would have charged a sizeable amount to correct.

Glynn P. LaBorde
Angola, LA

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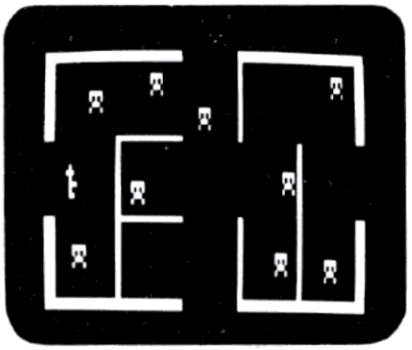
TALKING ROBOT ATTACK

NEW!



Actual unretouched photos

TALKING ROBOT ATTACK

INCREDIBLE! This amazing game actually **TALKS** without a speech synthesizer, through the cassette AUX plug.

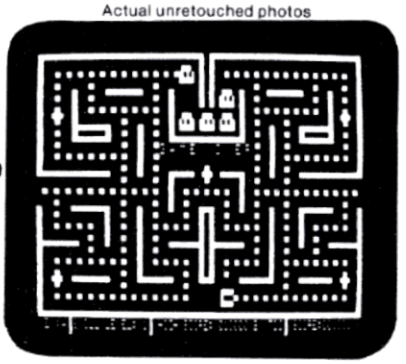
You are armed with just a hand held laser. In a remote section of the space station you encounter armed robots, some march towards you, some wait around corners. Watch out, the walls are electrified. Zap as many robots as you dare before escaping into a new section where more robots await you. The struggle continues. With Joystick action and **VOICE OUTPUT**, this game will amaze you.

ALL GAMES:

16K Level 2, Mod 1 + Mod 3 Cassette: $15.95
32k Level 2, Mod 1 + Mod 3 Diskette: $19.95
10% discount for 2 games, 15% for 3 or more
Games may be played with or without joystick.

NEW!

SCARFMAN



SCARFMAN

NEW!

THE LATEST ARCADE CRAZE now runs on your TRS-80.

It's eat or be eaten. You control Scarfman around the maze, gobbing up everything in your path. You attempt to eat it all before the monsters devour you. Difficulty increases as game progresses. Excellent high speed machine language action game. From The Cornsoft Group. With sound.

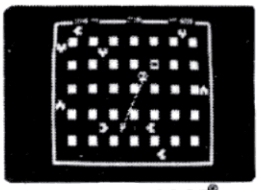
CAUTION: Played with the Alpha Joystick, Scarfman may become addictive.

SUPER NOVA®

Asteroids float ominously around the screen. You must destroy the asteroids before they destroy you! (Big asteroids break into little ones.) Your ship will respond to thrust, rotate, hyperspace and fire. Watch out for that saucer with the laser! As reviewed in May 1981 Byte Magazine.

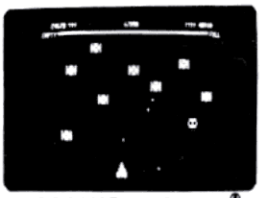
GALAXY INVASION®

The sound of the klaxon is calling you! Invaders have been spotted warping toward Earth. You shift right and left as you fire your lasers. A few break formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects!



ATTACK FORCE®

As your ship appears on the bottom of the maze, eight alien ships appear on the top, all traveling directly at you! You move toward them and fire missiles. But the more aliens you destroy, the faster the remaining ones become. If you get too good you must endure the "Flagship"... With sound effects!



COSMIC FIGHTER®

Your ship comes out of hyperspace under a convoy of aliens. You destroy every one. But another set appears. These seem more intelligent. You eliminate them, too. Your fuel supply is diminishing. You must destroy two more sets before you can dock. The space station is now on your scanner... With sound!

METEOR MISSION II®

As you look down on your view, astronauts cry out for rescue. You must maneuver through the asteroids & meteors. (Can you get back to the space station?) Fire lasers to destroy the asteroids, but watch out, there could be an alien FLAGSHIP lurking. Includes sound effects!

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- Compatible with any other TRS-80 accessories
- Saves your keyboard
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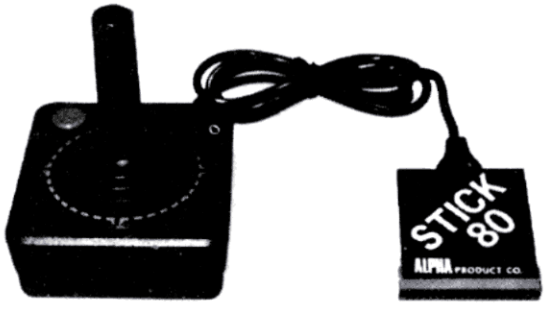
- Fully assembled, ready to plug in and use.

Price includes Atari Joystick + Alpha Interface + instructions + demo program. The Alpha Joystick is backed by an unconditional money back guarantee. If you are not delighted with it, return it within 14 days for a prompt and courteous refund.



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80 ACCOUNTANT

by Michael Tannenbaum C.P.A.

"When in printing mode, the program defaults to spooling."

Recently, I participated in several seminars on microcomputers. The VisiCalc program was demonstrated and a discussion held on the current state of microcomputers in accounting firms. The demonstration and discussion proved provocative: We were swamped with questions on applications. One of the most frequent was whether a microcomputer could be used as a word processor as well as a general purpose computer. Non-micro owners were confused. They could not imagine the same computer accomplishing both tasks.

Word processing computer vendors often emphasize the superiority of their dedicated processors over general purpose devices. However, except for display differences, a dedicated word processor and a general purpose computer are often identical. A word processor is a general purpose computer with a word processing program.

While many word processors can be used as general purpose microcomputers, not all micros are good for word processing. Some display only 40 characters on a line and their keyboards do not have a Selectric-compatible layout. A dedicated word processor has an important advantage: It is easier to learn. This element, often called user friendliness, is usually the main reason for selecting a dedicated over a general purpose device.

In comparison to other Tandy products, the Model II is equipped to serve as a word processor. Not only is the keyboard Selectric-compatible, but the 80-column display and graphics capability allow the Model II to emulate many features of dedicated word processors at a fraction of the cost. Scripsit and the Daisy Wheel II printer configure a very capable word processing work station.

New Improved Scripsit

Now Scripsit has been improved. Evidently Tandy listened to field reports and tried to incorporate all good suggestions.

The changes for the better become visible as soon as the menu page is displayed. Each numbered cell facilitates quick selection of a document for review or edit. The expanded processing options include printing, enabling the time display and ending the session.

The ability to print from the menu offers a first clue that the printing function is extensively revised. It is possible to print one document while revising another with a one disk system. Previously, this option (spooling) was only possible with two drives. If you select the print option, the document password request appears followed by a new monitor menu.

When in printing mode, the program defaults to spooling. To take advantage of this feature hit the escape key to return to the directory. You cannot delete or copy the document being printed, and certain disk functions like backup and format are inhibited. You can, however, open another document and perform all normal document entry and editing features.

The modified printer driver permits printing the special characters. French and Spanish characters available in the Daisy Wheel II character set have been predefined in a print control table. You can modify this table to match the character set and control functions on other printers.

To specify a special character such as Trade Mark(™) select the control key and the letter x. The letters A-Z designate the character or printer feature desired. The special character is displayed in reverse video preceded by the letter x. This display method indicates effectively the use of these special characters.

Because the Daisy Wheel II is capable of half-line spacing and reverse line feeds, Scripsit can accommodate superscripts and subscripts, important to the scientific community. Appropriate graphics characters visible in full video mode indicate the use of this feature. Graphics characters also indicate foreign letters formed by overstriking a letter with a diacritical mark. To use this feature, the system's printer must be able to backspace.

Although Scripsit utilizes features of the Daisy Wheel II, instructions facilitate the installation of other printers. Instructions are also provided to customize Scripsit for the special needs of each environment. Line feeds can be inserted after carriage returns, zeros slashed the cursor character changed and the strike through character changed. To properly calculate line width when justifying text by character, Scripsit must know the width of 10 and 12 pitch characters. This information can be altered to suit the printer available.

Text Entry

Text is entered in the same manner as Scripsit 1.0. After the new document is described to the system, a blank screen is presented to the typist. This working page is divided into two sections: the data entry portion and the system message area. The system communicates with the typist on the bottom two lines of the screen. After 22 lines, the copy scrolls up. During normal data entry, the 23rd line contains the document format line. The typist can change this line at any time. On the 24th line is the document name, cursor position, window start position, line spacing indicator, margin settings and entry mode indicator.

Scripsit always displays data single-spaced and unjustified. Many word processors display the copy as it will be printed. This can be an advantage when assembling text from different documents where the source documents might have different margin and line space settings. Scripsit, however, can overcome this problem by repaginating prior to printing. The repaginate utility conforms all pieces to a common standard. Scripsit's display method provides the greatest amount of data in the CRT space available.

During data entry, requests for utilities such as Global Search and Delete, Get Page, Print and so on can be initiated by depressing the control key and the first letter of the desired routine. If the particular sequence of commands does not gain the desired results, hitting the Escape key produces a series of menus. This menu command procedure is a major change from the previous version of Scripsit. In that version, hitting Escape twice brought you back to the menu accompanied by curses and exclamations as the

document closed itself out unexpectedly.

Under Scripsit 2.0, you have to select the appropriate code to quit a document. This code returns you to the menu gracefully. Attention has also been paid to ending a session of word processing. With version 1.0 this was only possible from the Disk Utilities menu. It was not possible to return to the operating system after a Scripsit session. To get to the command level in TRSDOS you had to Reset the computer. Now if you wish to terminate word processing activities, a command is available on the main menu to end the session. Then you can return to TRSDOS.

Examination of the more extensive menus available to the 2.0 user reveals some surprises. Tandy has provided a menu line to access user key and printer codes. When you select this line, keying in the indicated code allows you to call predefined phrases or operations with a key stroke. For example, a standard letterhead can be predefined and assigned to the 1 key. When a new letter requires the letterhead, keying in a 1 when the Special Function Key menu has been selected automatically recalls the letterhead. This special function key routine was available under the previous version, however it was more difficult to use.

Modules

The introduction of modular packaging for a word processing system makes good sense. A user who does not need specialized functions such as a dictionary or a math package need not purchase them.

One of the modules which should be available in January is the Spelling and Hyphenation Dictionary (Catalog No. 26-4534). This program and the related data base contain an incredible 100,000 words, making it the largest dictionary that I have seen for a micro system. Because of its size, it requires a one drive expansion interface for operation. Installation of the dictionary in a 2.0 system is quite simple. After you create a copy of the dictionary disk (do not use the original, altered by the installation procedure) select the Installation program to integrate Scripsit and the dictionary. Thereafter you can initiate a spelling check or hyphenation request from the appropriate Scripsit menu.

The hyphenation program scans the entire text and inserts soft hyphens where appropriate. A soft hyphen is produced by the word processor. If the text is altered during editing, the soft hyphen is automatically deleted. The rules for hyphenation used by the dictionary program were derived from good typing practice. They include the following:

- Hyphenate no more than two consecutive lines.
- Never hyphenate capitalized words.
- Never hyphenate the last word in a paragraph.
- Never hyphenate a word not in the dictionary.

When you request the spelling check, the dictionary is loaded. A system activity page indicates the time started, the page being processed, and the number of missing words discovered. After examination, the activity page indicates time completed and total words examined. The system processes text quite quickly. To examine this article, approximately 2000 words, took less than two minutes.

The system automatically reloads Scripsit and shifts into an edit mode. It then highlights the first word it did not find and presents a menu of choices. The typist can correct the word, add it to the user dictionary, delete it or skip it. If you select the correction option, the word is displayed on the message line. The F1 and F2 keys change or insert letters. If you decide to add the word to the user dictionary, the program requests a hyphenation decision. After a verification message, the program proceeds to the next word. Warning: The program has a capacity of only 1500 unmatched words. Should capacity be exceeded, you will have to make corrections to the edited portion before completing the document.

The user dictionary allows you to enter over 2000 words of your own. If you selected the MYWORDS option when you installed the dictionary, you can enter this user dictionary into Scripsit for evaluation, deletion and if incorrect, correction. This is accomplished by one of the new Scripsit 2.0 utilities—the ASCII/Scripsit conversion utility. This utility is not restricted to user dictionary maintenance, but can bring any ASCII file into Scripsit and turn any Scripsit file into an ASCII file.

Now Scripsit users can bring Basic programs into the word processor. This allows Scripsit utilities such as Global Search and Replacement to be applied to Basic programs. With Scripsit, sections of code can be moved, removed or stored as standard files. It is even possible to assemble a program just as a document is assembled. Word processing for program editing is not new. Owners of Electric Pencil and Wordstar have had this ability for some time. Now that I have tried it, I can understand why many rarely use the normal Basic editor for new program development.

Another use of this feature is the combination of VisiCalc and Scripsit. VisiCalc allows, under the printer option, the creation of an ASCII print image disk file. This file can then be converted to a Scripsit file. With the facility, text developed with Scripsit can be merged with schedules prepared by VisiCalc.

In general, the modifications made to Scripsit 1.0 are for greater ease of use. There is no doubt that the Shack Software experts are doing their homework. From the expanded Help menus to the new utilities, 2.0 represents a great step forward in "user friendly software." I understand that the Shack will offer an upgrade to 2.0 for 1.0 owners: It is well worth the additional cost. In addition, if you have a two drive system, I suggest the new dictionary. There need never again be a misspelled word in any document prepared by your firm.■

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SOFT BITS
a basic/assembly column

by Roger Fuller

An experiment in the 1930s accidentally revealed a startling relationship. It was discovered that vocabulary is a highly reliable predictor of intelligence. Mastery of words is necessary for the mastery of the concepts they represent, and the pronunciation of a word is the first step in mastering it.

I have noted the lack of a pronunciation guide for computer instructions. I do not mean for terms like PEEK, INPUT or RESTORE, but ones like STRING$, RND and VARPTR. I don't know whether to laugh or cry when I hear a programmer spell MID$ instead of pronouncing it.

I make a special effort to ascertain the way students grasp the information I am trying to communicate. This helps me detect and correct wrong thinking. Thus came about one of my bylines, "What you need is a Fuller understanding." I present for the informal approval of the readers of this column a list of standard pronunciations.

I chose the items in Table 1 from the reserved word list of Level II. The second column is the short, or reading, pronunciation. The third column is for maximum clarity. The criteria in choosing the two pronunciations are ease of use and clarity. If you have any other suggestions, please advise me via the magazine.

Although this list is not comprehensive, it is a guide and reminder to help you communicate when using Basic words in speaking. It also helps a beginner grasp Basic faster by providing a verbal image of Basic's vocabulary.

This Month's Program

Professional programmers write in as high a language as possible. This means avoiding machine coding. The reason is economics. Writing in a high level language saves time and money because the computer codes for you. In fact, Basic

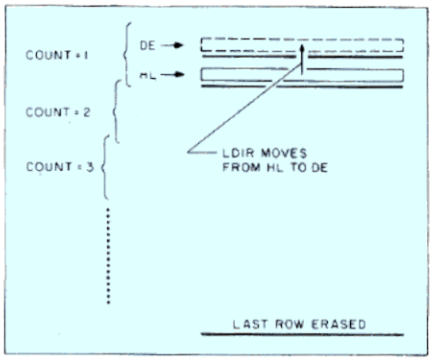

Fig. 1

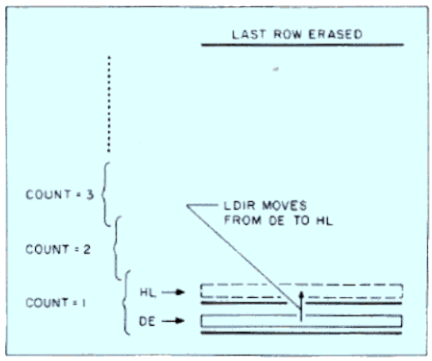

Fig. 2

Program Listing. Scrolling Window

```
10 '**************
11 'SCRLDEMO/BAS
12 '**************
30 CLEAR 10000      'VARIABLE LIST
35 '
40 DIM PA$(501)     'holds property addresses
41     PA$(0)=      ***** Top of List *****
42     PA$(501)=    ***** End of List *****
50 '   PN           number of properties in list
55 '   PD           index of item displayed at bottom of window
60 '   K%           keyboard image
70     KA%=14400    'keyboard row address
80 '   LT%          index for address displayed at top of window
90 '   LE%          index for address displayed at end of window
91 '   L$           temporary variable for determining USR address
92 '   L%           temporary variable for loops etc.
100 '
300 FOR L%=1 TO 100:
        PA$(L%)=STR$( (100000) * RND(32767) + RND(32767) ):
    NEXT:
    PN=100
1030 CLS:PRINT@0,
        "Property address  SCAN MODE"CHR$(31)
1040 PRINT"          Directions
1050 PRINT TAB(12) STRING$(2,143)
1060 PRINT"There is no property listed
1070 PRINT"or spelled as such.  Locate
1080 PRINT"the correct spelling of the
1090 PRINT"property by pressing the UP
1100 PRINT"or DOWN arrow key to scroll
1110 PRINT"the property addresses back
1120 PRINT"and forth.  After the right
1130 PRINT"spelling is found press the
1140 PRINT"CLEAR key so that you might
1150 PRINT"enter  the correct spelling
1151 PRINT"into  the  computer  again.
1160 '
1161 '***** Determine format of first window display
1170 IF PN<13 THEN PD=PN : LT%=0 : GOTO 1200
1180 IF PD<13 THEN PD=13
1190 LT%=PD-13 : LE%=PD
1200 FOR L%=0 TO 13
1210 PRINT@38+L%*64,;:
                    IF L%+LT%<=PN THEN PRINT PA$(L%);
                    ELSE L%=13 : PRINT PA$(501);
1220 NEXT
1221 '
1230 GOSUB 61000:IF PN<13 THEN LT%=-1 : LE%=501
1250 K%=PEEK(KA%) : IF K%=2 THEN 1290
1260 IF K%=8
     IF LT%>0 THEN LT%=LT%-1 : LE%=LE%-1 : PRINT@USR2(38),PA$(LT%);
1270 IF K%=16
     IF LE%<=PN THEN LE%=LE%+1 : LT%=LT%+1 : PRINT@USR1(870),PA$(LE%);:
     IF LE%>PN THEN PRINT@870,PA$(501);
1280 GOTO1250
1290 CLS:GOTO 1290
61000 L$="12345678901234567890123456789012345678901234567890123456789012"
61005 L%=VARPTR(L$)
```

Program continues

THE ALPHA I/O SYSTEM

a complete failure?

THE INSIDE STORY

It happened 3 years ago, when our President made a decision. At the time we specialized in custom analog and digital circuit design. The decision was to attempt to develop a line of standard interface hardware for the emerging microcomputers. At the time (1977) we had to decide which of the new machines could become the "industry standard" of the low cost micros.

Despite a few aggravating but minor deficiencies, the TRS-80 seemed tohave the most chance of success and it had the best price/performance ratio. Also, with some imagination, their large sales organization could become the largest service network in the world, a reassuring throught for the many novices in this new field.

It became clear that the TRS-80 could be used (with our then hypothetical system) to solve problems in many fields where computers were not yet used, mostly because of their high cost.

The IDEA was simple! ALPHA PRODUCT would supply the missing link between the TRS-80 and the "outside world". (more about this "outside world" later)

Early Survival

DANGER! If Radio-Shack entered the same market, we probably would not have survived, but the expectation was that they would be too busy developing their basic line (drives, printers, modem etc.). Thanks to our more specialized products, we would not be competing with them.

BAD START! We began with a failure. Our first product was supposed to be a simple, low cost, general purpose device. It would allow the TRS-80 to accept inputs other than the keyboard. Many kinds of external devices (the "outside world" mentioned before) like photocells, sensors, thermostats, switches, contacts, etc., could be connected easily. In addition, there were two relays to control (on or off) external loads such as motors, lamps, appliances, heaters, etc., etc. In other words, it would allow the computer to interact or interface with external devices. We called it the INTERFACER 2. What a mistake! It sounded too much like "expansion interface". Many enthusiastic TRS-80 users called thinking that our "INTERFACER 2" was a low cost Expansion Interface (at $85 that would have been a real bargain!). We wanted to change the confusing name. That meant reprinting the manual, changing the ad, scrapping the flyers, discarding the silk screened cases. Well, "INTERFACER 2" it would stay.

TROUBLE! We also found that the majority of TRS-80 users were AFRAID of the hardware. They could be very comfortable with fancy programming but thought you had to be a computer specialist or technically inclined to put the INTERFACER 2 to work. In truth, some IMAGINATION and a SCREWDRIVER is all you really need. Anyone able to wire a switch could use this device.

WORSE! There was also the fear of plugging a "foreign device" into the precious computer. This notion has all but disappeared as there are now so many quality products designed for the TRS-80 that plugging in a non Radio-Shack device has become common.

Our ad in Creative Computing (80-Microcomputing did not yet exist) hardly paid for itself. We had a decision to make. Were we wrong or just too early? Our first INTERFACER 2 was sold to someone who wanted to, and succeeded in, controlling his fancy model railroad with his TRS-80. Interesting, but what made us stick with the concept was that some of our INTERFACERS began finding use in applications with fascinating possibilities. Space is lacking to describe them, but the most exciting was the successful use of the system in assisting a handicapped young boy. We were pleased to hear of such a meaningful application.

Today

Three years later, as you can see in our ads, The INTERFACER 2 is alive and well. The price went up a bit, and despite the introduction of the more powerful INTERFACER 80, the sales have been steady.

Then came the least understood product! the ANALOG 80. This $139, nicely designed module is an Analog to Digital converter with 8 input channels. Used with your TRS-80, it provides a powerful "data acquisition system". This jargon simply means that you can monitor, measure and record 8 independant varying voltages. Very few people realized its real power. Such a system would have cost over ten thousand dollars just a few years ago.

The possibilities in scientific and engineering environments are endless. This system could replace chart recorders, digital data recorders, programmable calculators, data analyzers and many other specialized and expensive pieces of equipment. Furthermore, up to 8 ANALOG 80's could be used simultaneously for a total of 64 channels of analog input! They simply plug into the TRS-80 using our "X" series of bus extenders (EXPANDABUS).

The idea was simple. We would supply the missing link between the TRS-80 and the "outside world".....

Our next product was to be a second generation, Input/Output interface, with more flexibility than the INTERFACER 2. Careful design and refinement yielded the INTERFACER 80, the most powerful real world interface on the market today. It has 8 inputs, each optically-isolated and 8 outputs, each with a relay contact. The INTERFACER 80 is fully compatible with our ANALOG 80, allowing these to be used together in order to create systems that control external devices based on "sensed" input under control of the TRS-80.

A FAILURE! in spite of our extensive advertising, very few are aware of the existence of the powerful ALPHA I/O SYSTEM.

The Facts Are:

- The ALPHA SYSTEM/TRS-80 combination forms an incredibly versatile and powerful tool for acquisition/processing/control.
- In spite of its moderate cost, the system is sophisticated and reliable.
- The entire system can be easily programmed in BASIC using INP(X) and OUT X,Y commands.
- The modular approach and our EXPANDABUS allow for instant expansion as requirements demand.

The following pages contain more information about the devices mentioned here. We invite you to call or write to discuss your particular application.

Device descriptions; NEXT PAGE ➡

TIMEDATE 80

Neat, Compact Design
3 Years Battery Life

Slips Inside E/I
(Y Option Shown)

Real Time Without
Expansion Interface

- Complete, self contained "true" real time clock/calendar, TIMEDATE 80 continues to keep accurate time and date when the computer is turned off or experiences a power failure.
- **TIMEDATE 80** only needs to be set once, and it's two replaceable "AAA" batteries (not included) keep TIMEDATE 80 running in excess of 3 years. Costly Ni-Cad batteries and charging circuits are eliminated.
- The instant power is applied to the TRS-80, TIMEDATE 80 provides MO/DATE/YR, DAY of WEEK, HR:MIN:SEC and AM/PM information with quartz accuracy.
- **TIMEDATE 80** replaces the computer's internal clock. Extremely useful for automatic operation of remote systems with no operator in attendance. If the power fails and then is restored, only TIMEDATE 80 will update the system with current TIME and DATE information, an impossibility with the computer's internal clock.
- **TIMEDATE 80** is quartz crystal based with INTELLIGENT CALENDAR, including provisions for leap year! TIME display may be by 12 hour AM/PM or by 24 hour military and Eruopean format.
- **TIMEDATE 80** plugs directly into the rear of the TRS-80 keyboard and gives the "TIME$" function even without an Expansion Interface. For those with a disk system, it plugs into the left side panel of the Expansion Interface. An optional "Y" connector can provide for further expansion.
- **TIMEDATE 80's** small size keeps the computer table uncluttered. If you have an Expansion Interface, TIMEDATE 80 literally "DISAPPEARS" by slipping into the empty space in the bottom of the interface.
- Two sets of software, on cassette, come with TIMEDATE 80—"TIMESET" and "TIME$". "TIMESET" is a step by step set of simple instructions for setting TIMEDATE 80. "TIME$" is a set of poke routines which patch DOS and Level II TIME$ to read TIMEDATE 80 and is easily incorporated into any user software. "TIME$" will always print the time and date when LISTING a program—great for keeping track of revisions!
- Other valuable uses for TIMEDATE 80 are: accurate date and time information for business reports like payroll records, financial reports, etc., or to various I/O devices requiring 24 hour clock input, such as laboratory instrumentation, and to communication systems needing "Log In/Log Out" data (bulletin boards).
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behaves like a giant interactive macro assembler.

Sometimes machine coding cannot be avoided. In an application program I was able to avoid machine coding until I needed a screen review system. I wanted to display a list from 0-500 addresses; the screen could not contain them all at one time. A scrolling window on the list was the answer. Basic was not capable of the speed I required; this month's Basic/Assembly program provides the speed (see the Program Listing).

"Basic behaves like a giant interactive macro assembler."

The scrolling is controlled by pressing the arrow keys; the routine is exited after pressing the Clear key. I left off ancillary coding integrating this subroutine into my main program for clarity. This program will bomb on a Model III when the video is set for double width characters. It seems to be a hardware design fault. If you have tips or short programs, send them in.■

Program continued

```
61010 IF L%=32767 THEN L=PEEK(-32768) ELSE L=PEEK(L%+1)
61020 IF L%=32766 THEN H=PEEK(-32768) ELSE H=PEEK(L%+2)
61030 IF H*256 + L > 32767 THEN LH=H*256 + L - 65536
       ELSE LH=H*256 + L
61999 '
62100 '********************* SCROLLING WINDOW ***************************
*
62110 '                        BY ROGER FULLER
62120 '                        PUBLIC   DOMAIN
62130 '******************************************************************
*
62140 '
62150 '                 TOP     EQU     3C00H+39        ;LOCATION OF TOP RO
W
62160 '                 BOTTOM  EQU     3F80H+39        ;LOCATION OF END RO
W
62170 '                 COUNT   EQU     14              ;DETERMINED BY LOCA
TION
62180 '                                                 ;OF TOP AND END ROW
S
62190 '                 LENGTH  EQU     24              ;LENGTH OF ROWS MOV
ED
62200 '
62210 DATA 017038060:'  SCRLDN  LD      DE,TOP          ;DESTINATION ROW
62220 DATA 006013:'             LD      B,COUNT
62230 DATA 197:'        MOVUP   PUSH    BC              ;SAVE ROW COUNT
62240 DATA 213:'                PUSH    DE
62250 DATA 225:'                POP     HL              ;MAKE HL=DE
62260 DATA 014064:'             LD      C,64            ;LENGTH OF VIDEO LI
NE
62270 DATA 175:'                XOR     AF              ;GET A ZERO HEX BYT
E
62280 DATA 071:'                LD      B,A             ;TO MAKE BC=0040H
62290 DATA 009:'                ADD     HL,BC           ;MAKE SOURCE 1 ROW
LOWER
62300 DATA 229:'                PUSH    HL              ;SAVE SOURCE ADDRES
S
62310 DATA 014024:'             LD      C,LENGTH
62320 DATA 237176:'             LDIR                    ;SEE DIAGRAM 1
62330 DATA 209:'                POP     DE              ;MAKING SOURCE ROW
62340 '                                                 ;NEW DESTINATION RO
W
62350 DATA 193:'                POP     BC              ;RETRIEVE ROW COUNT

62360 DATA 016239:'             DJNZ                    ;LOOP TIL COUNT DON
E
62370 DATA 033102063:'          LD      HL,BOTTOM       ;POINT TO END ROW
62380 DATA 024026:'             JR      ERASE           ;ERASE END ROW
62390 '
62400 '
62410 '
62420 DATA 017102063:'  SCRLUP  LD      DE,BOTTOM       ;
62430 DATA 006013:'             LD      B,COUNT         ;
62440 DATA 197:'        MOVDN   PUSH
   BC
             ;SAVE ROW COUNT
62450 DATA 213:'                PUSH    DE              ;
62460 DATA 225:'                POP     HL              ;MAKE HL=DE
62470 DATA 014064:'             LD      C,64
62480 DATA 175:'                XOR     AF
62490 DATA 071:'                LD      B,A
62500 DATA 237066:'             SBC     HL,BC           ;MAKE SOURCE 1 ROW
HIGHER
62510 DATA 229:'                PUSH    HL              ;SAVE SOURCE ADDRES
S
62520 DATA 014024:'             LD      C,LENGTH
62530 DATA 237176:'             LDIR                    ;SEE DIAGRAM 2
62540 DATA 209:'                POP     DE              ;MAKES SOURCE ROW T
HE
62550 '                                                 ;NEW DESTINATION RO
W
62560 DATA 193:'                POP     BC              ;RETRIEVE COUNT
62570 DATA 016238:'             DJNZ    MOVDN           ;LOOP TIL COUNT DON
E
62580 DATA 033038060:'          LD      HL,TOP          ;POINT TO TOP ROW
62590 '
62600 '
62610 DATA 062032:'     ERASE   LD      A,' '           ;GET A SPACE
62620 DATA 006024:'             LD      B,LENGTH        ;LENGTH OF LINE TO
CLEAR
62630 DATA 119:'        CLSLN   LD      (HL),A          ;ERASE A POSITION
62640 DATA 035:'                INC     HL              ;POINT OT NEXT POSI
TION
62650 DATA 016252:'             DJNZ    CLSLN           ;LOOP TIL DONE
62660 DATA 201:'                RET                     ;BACK TO BASIC
62670 '
62690 FOR X=1 TO 39
62700 READ L$
62710 FOR L%=1 TO LEN(L$)/3
62720     BYTE=VAL(MID$( L$, (L%-1)*3+1, 3) ) : POKE LH, BYTE
62730     IF LH=32767 THEN LH=-32768
62740     LH=LH+1
62750     CS=CS + BYTE
62760 NEXT
62770 NEXT
62780 IF CS<> 6364 THEN CLS: PRINT " TYPING ERROR " : STOP :
       ELSE DELETE 62100-62990
62990 '*****************************************************************

63000 IF PEEK(16396)=195 THEN DEFUSR1=LH :
       IF LH+27 < 32768 THEN DEFUSR2=LH + 27
         ELSE DEFUSR2=LH + 27 -65536
63001 IF PEEK(16396)=93  THEN L=LH AND 255 : H=( LH AND 65280 )/256:
       POKE 16526, L : POKE 16527, H
63010 RETURN
```


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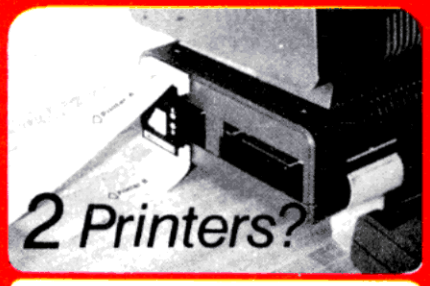

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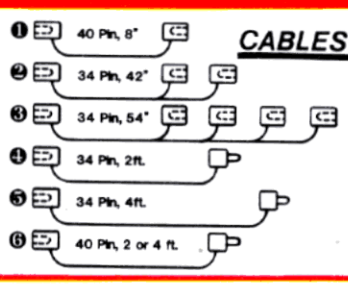

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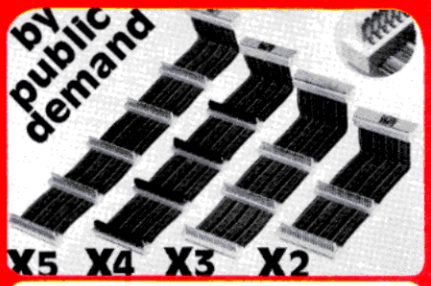

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GREEN SCREEN WARNING

IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING**: all Green Screens are not created equal. Here is what we found:

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
- Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
- One "optical filter" is in fact plain acrylic sheeting.
- False claim: A few pretend to "reduce glare". In fact, their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
- A few laughs: One ad claims to "reduce screen contrast". Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
- Drawbacks: Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube.

Many companies have been manufacturing video filters for years. We are not the first (some think they are), but we have done our homework and we think we manufacture the best Green Screen. Here is why:

- It fits right onto the picture tube like a skin because it is the only **CURVED** screen **MOLDED** exactly to the picture tube curvature. It is Cut precisely to cover the exposed area of the picture tube. The fit is such that the static electricity is sufficient to keep it in place! We also include some invisible reusable tape for a more secure fastening.
- The filter material that we use is just right: not too dark nor too light. The result is a really eye pleasing display.

We are so sure that you will never take your Green screen off that we offer an unconditional money-back guaranty: try our Green Screen for 14 days. If for any reason you are not delighted with it, return it for a prompt refund.

A last word: We think that companies, like ours, who are selling mainly by mail should •list their street address •have a phone number (for questions and orders) •accept CODs: not every one likes to send checks to a PO box •offer the convenience of charging their purchase to major credit cards.

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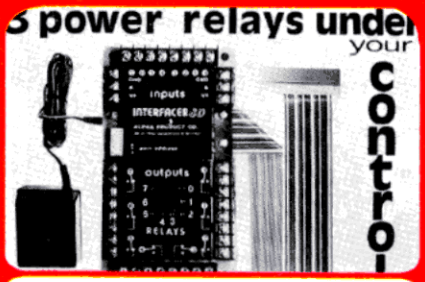

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Reserved Word	Informal	Formal
*	times	—
@	at	at location
ABS	abs	absolute value of
AND	—	logically anded with
ASC	ask or asky	ASCII (asky) value of
ATN	arc tan	arc tangent of
CDBL	compute double	compute double precision
CHR$	character string	character string of
CINT	compute integer	compute integer precision
CLOAD	C load	cassette load
CLOAD"A"	C load A	cassette load file A
CLOAD?"A"	verify load A	verify cassette load A
CLS	clear screen	clear the screen
CMD	command	—
CONT	continue	continue program
COS	coss	cosine of
CSAVE	C save	cassette save
CSNG	compute single	compute single precision
CVD	convert double	convert double precision
CVI	convert integer	convert integer precision
CVS	convert single	convert single precision
DATA	—	data list
DEFDBL	define double	define double precision
DEFFN	define function	define as function
DEFINT	define integer	define integer precision
DEFSNG	define single	define single precision
DEFUSR	define user	define user routine
DEFSTR	define string	define a string
DIM	—	dimension
EOF	end of file	end of file
ERL	error line	—
ERR	err	error
ERROR	error	error
FIELD	—	field buffer
FIX	fix	truncate via fix
FN	F N	function
FRE	free	free string space
INKEY$	in key	inkey string
INP	in port	input port
INPUT	input	—
INPUT"message";	input with prompt	input with prompt string
INSTR	in string	—
INT	integer	integer value
LEFT$	left string	—
LSET	L set	left set
LEN	—	length string
LOF	last of file	—
LOG	—	natural log
LPRINT	L print	line print
MEM	—	free memory
MID$	mid string	—
MKD$	make double string	make double precision string
MKI$	make integer string	make integer precision string
MKS$	make single string	make single precision string
NOT	—	—
OR	—	logically Ored with
OUT	out	out port
POS	position	cursor position
RANDOM	random	randomize
RND	rand	random
REM	rem	remark line
RIGHT$	right string	—
RSET	R set	right set
SGN	sign	—
SIN	sign	—
SQR	square root	—
STRING$	string string	—
STR$	strings	make string
TAN	tan	tangent
TIME$	time string	—
TROFF	trough	trace off
TRON	—	trace on
USING	—	using format
USR	usr	user function
VAL	val	value
VARPTR	var pointer	variable pointer

Table 1. Level II Pronunciation Guide

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80 REVIEWS

edited by Michael E. Nadeau

"The British government's BBC has been transmitting teletext through CEEFAX longer than any other videotext operation."

Videotext: The Coming Revolution in Home/Office Information Retrieval
Efrem Sigel, et al.
Knowledge Industry Publications, Inc.
New York, NY
Softcover, 152 pp.
$8.95

by Nancy Robertson

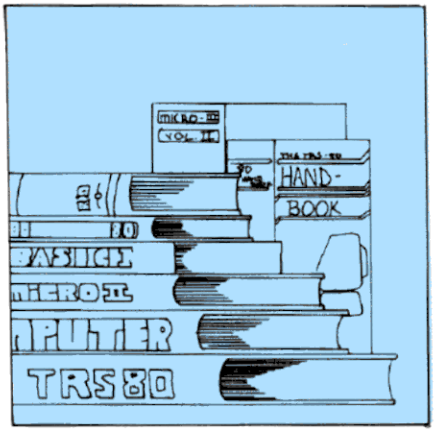
The promotional blurb on the back cover of *Videotext: The Coming Revolution in Home/Office Information Retrieval* states, "New technologies and economic forces are turning the familiar tv screen into a true information terminal . . . *Videotext* is essential reading for everyone involved in the communication of information."

Cover blurbs tend to be overstated. Yet it is true that videotext, "printed information transmitted to a tv or computer terminal video display," has attracted the interest of major economic forces. The governments of Britain, France, Germany and Japan have each invested millions to research videotext's potential markets and to establish videotext technology. According to the authors, these groups are betting on "the willingness of business (and some individuals) to pay high costs for information, provided the information is tailored to their needs and can be delivered nearly instantaneously" The book defines the terminology of the new technology, looks at its history, and gives an overview of the present.

Videotext is differentiated in the book as teletext and viewdata. In teletext, "Items can be broadcast on unused lines of the normal tv picture and displayed on any tv set equipped with a special adapter to read the information." Generally, users are passive, which means they cannot respond to the information directly through the same system.

Viewdata uses a tv set as a computer terminal (like Radio Shack's Color Computer) and signals travel over telephone lines. It is called interactive because the users can request specific information from their terminals. CompuServe and The Source are the viewdata services most familiar to American microcomputer users.

While the success of CompuServe and The Source indicates a positive future for videotext business, "A Survey of Attitudes Toward Cable Television," conducted by Peter Hart Research Assoc., Washington, DC indicates a limited interest in videotext. The 1979 survey found that videotext rated lowest in viewer popularity of eight types of cable tv service.



However, developments in the videotext field come rapidly, as they do in microcomputing. Businesses and governments are maintaining an interest.

The British government's BBC has been transmitting teletext through CEEFAX longer than any other videotext operation. CEEFAX's director Colin McIntyre writes in *Videotext*, that "videotext, or informational television, is Spartan in its use of the radio spectrum," and the cost of computer storage (which keeps track of CEEFAX's news and other information) is "dropping by 35 percent a year."

At the time McIntyre was writing, CEEFAX was offering news, financial reports, an entertainment guide, and jokes and puzzles.

"The BBC spent less than 200,000 pounds to put CEEFAX on the air," McIntyre writes. "Teletext needs no extra bandwidths, no extra transmitters, no extra power. The CEEFAX signals are simply squeezed onto just four out of every 625 lines of the ordinary television picture." He adds that "direct costs of CEEFAX come to about 200,000 pounds annually" with the cost of an adapter being the only viewer charge.

McIntyre believes that a "reliable low-cost printer" for home or office is the "one missing link" in the development of widely-used teletext service. If adapters are made available to consumers at affordable prices, and if the information consumers want is broadcast, McIntyre believes teletext will quickly become an accepted medium.

The authors of *Videotext* also argue that "Television programming uses enormous chunks of the bandwidth (portions of the radio frequency spectrum). This means that relatively few channels can be made available by governmental authorities for broadcasting. Whatever the nature of economic support for broadcasting, there will be pressure to use these scarce channels to reach the largest number of people. That inevitably means mass entertainment." Teletext provides an alternative.

Prestel, the oldest viewdata network, was also begun in Britain. The British Post Office and Telephone Agency hoped it would provide a new source of telephone revenue. In 1979 surveys showed that only 60 percent of British homes had telephones. It offers an information network transmitted over telephone lines to home terminals and televisions adapted to function as terminals. Prestel officials stress that their system has fantastic storage potential, that it is interactive, and that it can relay information instantaneously.

Rather than dictating the information transmitted by Prestel, the British Post Office asked interested companies to provide it. "So far, more than 150 publishing and other organizations have contracted with the Post Office to supply nearly 200,000 pages of information under a wide variety of headings."

Prestel users pay a local telephone call charge; a time charge for connection to the computer, and varied charges for each page.

Videotext considers CEEFAX and

Prestel thoroughly, even redundantly, and then goes on to discuss videotext developments in other countries. The heavy emphasis on CEEFAX and Prestel was probably mandated by their history in a field whose changes are too rapid to be tracked by a book. The last chapters, dealing with videotext in Canada, France, the United States and other countries, are the most impressive. For American readers, it may be disappointing to see so little coverage given to Qube, CompuServe, The Source and other American developments. But the book provides the only comprehensive overview of international videotext developments.

The estimated cost of developing the different systems discussed, along with the names of the companies who provided the hardware and software, is provided. An appendix lists the addresses of companies involved with videotext businesses and technology. *Videotext: The Coming Revolution in Home/Office Information Retrieval*, written by people who are well-established in the young field, is clearly addressed to business readers, and for them it is an excellent source. But *Videotext* is not "essential reading for everyone involved in the communication of information."■

Pascal
David L. Heiserman
Tab Books, Inc.
Blue Ridge Summit, PA
350 pp.
$15.95 Hardcover
$9.95 Softcover

by Ken Webb

When I purchased Radio Shack's Tiny Pascal tape, I knew next to nothing about that language. I hoped a good dose of it might help me better organize my Basic programs. Current wisdom has it that extended exposure to Basic encourages sloppy programming habits; Pascal is the recommended antidote.

The short user's manual that comes with Tiny Pascal assumes the reader has a knowledge of standard Pascal. It suggests several textbooks for the uninitiated. I tried one of these but found it frustrating.

A few days later I found David Heiserman's book *Pascal* in a bookstore. He never mentions Radio Shack's Tiny Pascal, but I quickly verified that Supersoft's TRS-80 Tiny Pascal (which this book describes) is the same thing. Mr. Heiserman is "an independent...consultant who works in the development of machine intelligence," and has done extensive writing.

Heiserman immediately addresses the question of how your experience with Basic will effect your progress with Pascal. He feels that "a previous knowledge of Basic is a two-edged sword when it comes to learning Pascal. On one hand, you will find that the kind of thinking that goes into developing moderately sophisticated Basic programs will serve as a firm stepping stone for getting started in Pascal. On the other hand, you will have to break some old habits, especially some questionable programming habits that Basic can tolerate but Pascal cannot."

A Few Flaws

The book is plagued with typographical errors, inexcusable in a book where a missing semicolon can doom a sample program. On the positive side, I found that constant vigilance for typos made me pay closer attention to the details of sample programs as I typed them in. But I had to give up on several examples that wouldn't work, and I've been afraid to enter any of the longer game programs at the back of the book.

A problem common to most programming texts: it was hard to get the book to lie flat while typing in a sample program. I've solved this by laying an 8½ by 11 sheet of window glass over the opened book.

Excellent Content

The actual content of Heiserman's book is excellent. Most features of Tiny Pascal are exhaustively described. There's no chance of getting lost if you start at the beginning and work your way through. The first chapter tells you how to load the Tiny Pascal tape, and describes most of the monitor and editor commands available, complete with a printout of the screen output at each step.

The book then introduces Pascal's Write and Read statements, so the reader can immediately start to see things happen. Write and Read are not direct translations of Print and Input from Basic, nor are they quite the same as the statements in standard Pascal. Heiserman goes well beyond the incomplete description provided in the user's manual.

In the chapter on arithmetic and logic operations, Heiserman does a good job explaining how the Pascal assignment operator := improves on Basic's sloppy = operator. On the other hand, probably only Assembly/machine language programmers will fully appreciate his short comments on the MOD, SHL, and SHR functions.

I didn't find any description of the Call or Move commands, which are both mentioned in the user's manual.

The Back of the Book

Exhaustively described and documented game programs in the back of the book include graphic dice, graphic slot machine, missile shoot, real-time animation, hangman, screwball golf, and a whole chapter devoted to a space ranger mission game. There's also a chapter on structured programming, comparing top-down and bottom-up program design, and another on translating between Basic and Tiny Pascal.

"The book is plagued with typographical errors, inexcusable in a book where a missing semicolon can doom a sample program."

Do you need *Pascal* by David Heiserman? I'd say yes, if you have the Tiny Pascal tape and little or no previous knowledge of Pascal. If you're an old hand at standard Pascal, you'll find it useful if the user's manual and your own experiments don't sufficiently clarify the differences between Standard and Tiny.■

Microsoft Basic Decoded & Other Mysteries
by James Farvour
IJG
Upland, CA
Softcover, 312 pp.
$29.95

by Terry Kepner

This book was written by James Farvour and edited by Jim Perry (former editor of *80 Microcomputing*). However, it was Harv Pennington's convincing arguments that persuaded Mr. Farvour to begin writing it over a year ago.

The book's cover is somewhat reminiscent of *TRS-80 DOS and Other Mysteries*, as indeed it should be, since it was designed by Harv Pennington, but that is where the similarity ends.

In his foreword, Harv says that "This book will delight both the professional and the beginner." For the professional, this is undoubtedly true, but the beginner will find the book intimidating at first glance, and formidable upon the second. When you read it you'll discover it isn't quite as lucid as promised in the foreword.

Chapter one covers the general outline of an operating system; Level II Basic ROM and DOS memory utilization; the RAM communications region; Level II Basic ROM operation (input phase, interpretation and execution, verb action, arithmetic and math, I/O drivers and system utilities); and system flow during initial computer power-up for both non-disk and disk systems.

The chapter is written in an easy and straightforward manner. There are many diagramatic memory maps, flowcharts and other information tables, all clearly marked and simple to grasp. Explanations are very clear and easily understood. This chapter readily fulfills the promise of the foreword.

Chapter 2 is another story. Unfortunately, it handles the Level II Basic ROM subroutines in a very disappointing manner.

The chapter is broken into two levels; the first divides the chapter into sections on video, printer and math routines, etc., the second deals with the routines themselves in individual subsections. The first line of each subsection is the call address, followed by a brief label describing what the call does. A brief paragraph follows, explaining what happens when you call the subroutine. Then a short example program is presented (at least I think that's what it is, the book doesn't tell you) that uses that call. The sample programs contain only the Z 80 mnemonics, their extensions and a comment, leaving out the opcodes.

For example:

```
CALL 0E6C                    ASCII to Binary
Converts the ASCII string pointed to by HL to binary. If
the value is less than 2**16 and does not contain a deci-
mal point or an E or D descriptor (exponent), the string
will be converted to its integer equivalent. If the string
contains a decimal point or an E, or D descriptor or if it
exceeds 2**16 it will be converted to single or double
precision. The binary value will be left in WRA1 and the
mode flag will be to the proper value.
;
;
;
        LD      HL,AVAL     ; ASCII NUMBER
                .
                .
                .
AVAL    DEFM    '27457'     ; ASCII VALUE TO BE
                              CONVERTED
        DEFB    0           ; NON-NUMERIC STOP
                              BYTE
                .
                .
```

> *"The sample programs contain only the Z80 mnemonics, their extensions and a comment, leaving out the opcodes."*

This example purports to show you how to convert an ASCII string to a binary number. The reference to DEFB 0 is the only reference to the fact that your string must end in either a comma or a zero byte (but you'll notice that the comma is not mentioned at all). I have seen other books devote an entire page or more to this one procedure.

Furthermore, the DEFM assembler command was used in the example to tell the program where to find the string. For the beginner, this implies there is no other way to do it. Actually all you have to do is load the HL register with the location of the ASCII string to be converted. This allows you to use program inputs from external sources.

This is true of all subroutine explanations in the book. The author often goes to unnecessary lengths to set up a sample program for explanation purposes, only to unnecessarily confuse the beginning programmer.

This chapter also fails to warn you sufficiently on the inherent dangers of the routines. For example, if you CALL 13F2 (exponentiation, raising x to the power y) there are three fatal errors which will return control to Level II Basic ROM. None of these are mentioned in *Microsoft Basic and Other Mysteries*.

Chapter 2 also lacks completeness. For example, the video display doesn't tell you that scrolling can be accomplished simply by executing CALL 0553H. Neither does it tell you how to achieve a partial clearing of the screen. The cassette I/O section doesn't tell you how to turn off the cassette motor (CALL 01F8H), although it does tell you how to turn it on!

I was very disappointed with chapter 2.

Chapter 3, on the other hand, appears to be very complete, even giving you the timing constraints used by the TRS-80 when reading and writing to the tape, including idealized waveforms!

The disk I/O section gives diagrams of the disk, the Hash Index Table, the Granule Allocation Table and the directory track. In fact, the only book containing more information on these topics is *TRS-80 DOS and Other Mysteries*.

Chapter 4 concerns the addresses and tables used by Level II Basic ROM when it is in operation. Things like the reserved word list, Error Code Table, Mode Table, verb action routines, Program Statement Table and half a dozen other tables are all covered quite adequately. Most of these tables I've never seen mentioned in any other book about Level II Basic ROM.

Chapter 5 is simply an example program that shows you how to implement your own verb in a DOS environment, listing the steps needed to load and use the routine from disk.

Chapter 6 demonstrates how to use the tables in the communications region to load and execute a series of Basic program overlays. Using these methods, you can chain in sections of a 96K Basic program in a 32K RAM machine without losing any variables—a very nice possibility.

Chapter 8 is 246 pages in length. It is a complete (except for mnemonic extensions) disassembly of the entire Level II Basic ROM, from 0000H to 302AH, with extensive comments, and including the Z 80 opcodes stored in the ROM. This chapter alone justifies the purchase of *Microsoft Basic and Other Mysteries*, as well as supplying most of the items omitted in the

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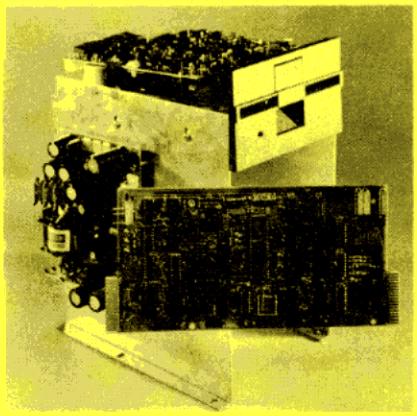

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other chapters.

The pages of the book have been carefully sized to 62 lines of print per page, perfectly matching the output from Apparat's disassembler. If you have a printer capable of printing 66 lines per 11-inch page, you can run your own disassembly of the ROM to get the extended mnemonics that have been left out of the book because of copyright laws.

To facilitate this, the pages of the book have been predrilled, and the binding prepared for their removal and insertion into a three-ring binder. Everything possible has been done to assure that you can easily have a complete commented disassembly of the Level II Basic ROM.

Chapter 7 (thought I'd forgotten it, didn't you) is devoted to delineating the differences between the old Level II Basic ROM (which powers up with "Radio Shack Level II Basic") and the new Level II Basic ROM (which powers up with "R/S LII Basic"). This is an addition no other book on the market has yet made.

Despite the unevenness and omissions of the first six chapters, the book is well worth its price because of the completeness and accuracy of the seventh and eighth chapters. Both beginner and professional will find it a welcome addition to their library, although the beginner may have a rough time reading and understanding it.

Without a doubt, it is the most comprehensive book on Level II Basic ROM to be published so far. It is also the most comprehensive book on the interactions of Level II Basic ROM and TRSDOS, although the DOS information assumes that you have Apparat's NEWDOS. (This is only a slight handicap, as most of the other DOS's on the market have tried to emulate NEWDOS as much as possible).■

Pascal Primer
David Fox and Mitchell Waite
Howard W. Sams & Co., Inc.
Indianapolis, IN
Softcover, 206 pp.
$16.95

by Margaret M. Grothman

Pascal Primer, despite its strengths, may not be the book of choice for TRS-80 users. The experience of the authors and their obvious care and planning are impressive. Nevertheless, it has critical flaws.

The beginning programmer is the intended audience of *Pascal Primer*. Although not absolutely necessary, he or she should know a little Basic, because the book uses Basic to explain some Pascal concepts. The authors do a consistently good job of addressing beginners. They do not treat learners as though they are not very bright, yet they are careful to explain everything, not falling into the common trap of assuming that beginners already understand simple concepts. For example, the first time that the word "cursor" is used, it is defined in a footnote.

Pascal Primer is about programming, not about the use and characteristics of compilers and editors; the student will have to learn about those elsewhere. While this limitation makes sense for a book which is intended to be of interest to all Pascal users, it causes some problems for a real beginner. If you know nothing about Pascal, you will need to learn about your compiler and editor before you can do any programming at all. Yet, to become familiar with these, you need to be doing some programming. It seems most effective to begin learning about all aspects at the same time from the same source.

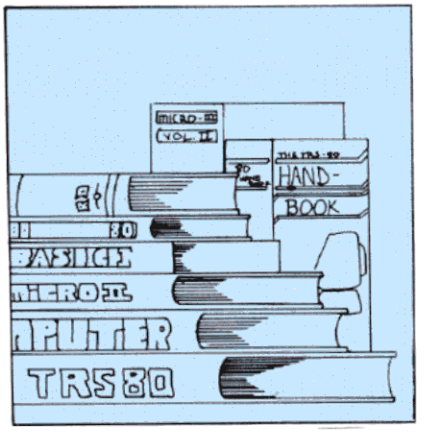
The book is based on UCSD (University of California San Diego) standard Pascal, which is the most widely used version. This also makes sense, but causes trouble for a TRS-80 Pascal beginner who may be using Tiny Pascal, which is a subset of standard Pascal. Many of the functions and commands explained in *Pascal Primer* do not exist in Tiny Pascal. This conflict first appears in Chapter 2, where certain commands are introduced with the implication that they are universals used in all Pascal versions. These are Program, Begin, End, Write, WritIn and GOTOXY statements. Of these, only Begin, End, and Write are used in Tiny Pascal. The programming examples employing these six words are not usable by a Tiny Pascal programmer. Translating the examples is possible, but not by the beginner for whom the book is intended. The third chapter, on variables and inputting, contains much information which is useless to the Tiny Pascal user, who may only use integer and integer array variables. This pattern continues; Chapter 9 on strings and long integers does not relate to Tiny Pascal at all. A novice could waste a good deal of time learning the wrong things from this book.

What about an advanced beginner? If a person already knew how to compile and edit, and knew enough about his own brand of Pascal to ignore what did not apply, the book could be valuable. It does a very nice job of explaining the advantages of Pascal over Basic, and the principles of structured programming. Some Pascal concepts which are not explained clearly in other beginning texts, are done very well here: for example, the differences between functions and procedures, the differences between local and global variables, and the differences between value and variable parameters. Recursion is dismissed, perhaps wisely, as being too ambitious for a beginning text.

Another attribute of the book is the enrichment material it provides. Chapter 1 offers a history of the development of Pascal, and biographical sketch of the eccentric genius, Blaise Pascal, for whom the language is named.

The text is interspersed with numerous whimsical illustrations, and the pithy sayings of a fanciful character named Uncle Pascal. An example: "Make sure you protect against entering letters when Pascal is expecting a number! Uncle Pascal says: Those who put oranges in apple crates will never end up with applesauce."

These diversions may or may not appeal to you, depending on whether you are in a hurry to learn, or if you prefer a more leisurely pace, with a little distraction to lighten the task.



The authors used an Apple II computer and Apple UCSD Pascal for the development of the programs used in *Pascal Primer*. Despite their claim that the book can be effectively used with any computer and with any version of Pascal, it may be that the Apple II user stands to gain more from the book than the TRS-80 user.■

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The Pascal Handbook
Jacques Tiberghien
Sybex
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Softcover, 473 pp.
$14.95

by Dennis Bathory Kitsz

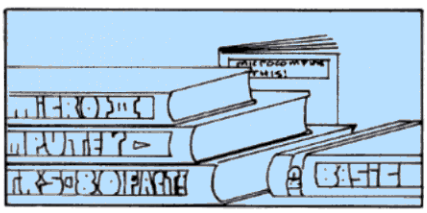
As a preface to this review of *The Pascal Handbook*, my biases should be revealed: I have found most books from Sybex (particularly those written by publisher Rodnay Zaks) to be largely illiterate, filled with numerous typographical errors and as many misconceptions, often confusing, and containing an inordinate amount of material duplicated from one Sybex book to another.

The Pascal Handbook is different. It is, most of all, a true handbook that makes no attempt to teach, reflect or elucidate. Rather, it contains hundreds of pages of words used by and about Pascal, with a straightforward and comprehensive outline of the what's and where's of each word. Tiberghien refers to the words and concepts collectively as "features." Since Pascal features are used differently from version to version, descriptions are provided for each feature as it exists in alternative versions of the language. These variants include the original Jensen and Wirth definition for the Control Data 6000, the proposed ISO standard, the University of California at San Diego (UCSD) Pascal, Hewlett-Packard 1000, OMSI Pascal-1 for the PDP-11, and Pascal/Z for the Z80 compiler. Each word is categorized either as a symbol, an identifier, or a concept.

As the companion volume to Zaks' *Introduction to Pascal*, it is a superior work. Instead of circumlocutory explanations in elaborate English, each Pascal feature is described under four terse headings: syntax (words and/or diagrams), description (meaning, use and effect), implementation-dependent features (described by the author as "enhancements or restrictions to the use of the entry that are specific to the various implementations of Pascal"), and examples (illustrations independently and in context).

Each Pascal feature is presented with extraordinary clarity; even typeface plays an important role. Boldface headers indicate reserved words, uppercase is used for identifiers, and lowercase refers to concepts. Large type aids any search through the book. Although putting the keywords in alphabetical order doesn't parallel any logical relationship in Pascal, it certainly simplifies using the handbook. Even the layout of the book, with each keyword boxed over a grey lined background, contributes to its accessibility.

The Pascal Handbook is not intended to assist the reader to learn to program in Pascal, although the number of examples and their indentification and explanation is almost capable of teaching the language. It is purely a reference work, but with a unique completeness that includes the definitions of not only what are normally considered features of any language, but also the explanation of every ASCII character or symbol with a meaning within Pascal, including parentheses, brackets and punctuation. Most gratifying is the fact that the book is current, accurate and surprisingly free of typographical errors.



I have only one minor suggestion: The number of examples of each feature could be increased. For those words whose functions are extensive, which are seldom used, or whose application varies considerably in different versions of the language, more actual programming examples would be welcome. *The Pascal Handbook* would then serve not only as a programming reference, but also as a powerful tool for evaluating and selecting systems using the various implementations of Pascal.■

Draw5 and Stud5
Wilson Software Division
Camp Hill, PA
$13 each

by Lloyd Martin

I'm not a gambling man, but I do enjoy a friendly game of poker now and then. Poker is considered to be, at least by those who win at it, a game of skill. True, you're dealt a random sequence of cards, but the skill comes in with how well you play the cards that you are dealt. I wanted to sharpen my poker playing skills and I thought that, at least in the mechanical aspects of the game (i.e., money management and betting strategies), playing poker against a computer would be the cheapest way to do it. Draw5 and Stud5 proved to be more than skill sharpeners, though.

There are many poker programs available, but they all consist of the computer playing one hand of cards—and as far as I'm concerned, there are few things less exciting than two-handed poker. When only 10 or 15 cards are dealt the odds of getting a good hand are low—and it's just not as exciting as playing against five or six other players.

Six Hands Against You

This is the most unique thing about Draw5: The computer plays six hands against you—and the six hands all play against one another even after you have dropped out of the round. Each player that the computer simulates has a name and his own individual style of play. One player might consistently bluff while another would never bluff, and some of the players bluff at random. After a while each of the simulated players take on its own individual personality—it's most uncanny.

And if that isn't enough, after a few hands, the other "players" begin to figure out your style of play and alter their playing styles to counter your style.

Draw5 is played according to standard Gardena Card Club rules (a pair of Jacks or better to open, etc.) and the program does not allow cheating. If you can't open it automatically passes you.

I did find one minor bug in the program. We were sitting around one night playing draw poker—with real cards and real people. It came time for the draw, and Holly, our 14-year old, said that she wanted to draw five cards. I told her that the most that she could draw, according to the rules, is three cards. "But the computer let me draw five cards," she protested.

Wilson Software also sells a game called Stud5 which is identical to Draw5 in concept except that it plays five-card stud poker. Stud5 is as well designed as Draw5, except I enjoy playing draw poker more than I enjoy playing stud poker.

On the whole, I find computer games to be quite boring after an hour or so—I buy them mostly for the kids. Draw5 is one of the few exceptions. I find the simulation completely engrossing and a good buy.

Draw5 has definitely sharpened my playing skills—anyone for a friendly little game?■

Commbat
Adventure International
Longwood, FL
$19.95 cassette, 16K Models I & III
$24.95 disk, 32K Model I

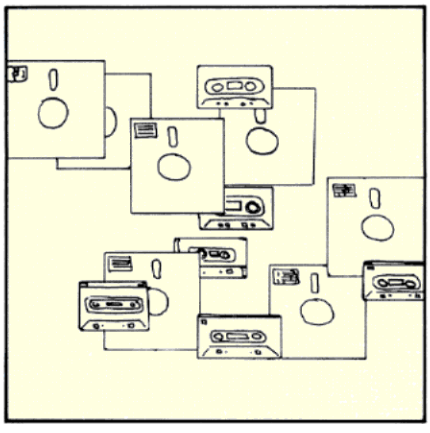
by John W. Warne

Commbat, a next generation computer game, requires two machines to play. It is a real-time war game within a 64 by 64 grid divided into eight sectors of 32 by 16 each. The machines keep track of eight tanks, three decoys, one base and a host of armaments belonging to each player. The machines do this, however, without revealing the whereabouts of the other side until you move one of your tanks within viewing range (a 5 by 5 grid surrounding your tank).

Your battle display shows the area around any one of your tanks, your base and one of your three decoys on the right side of your screen. The left side of the screen contains either a command help list (Table 1) or a display of any one of the eight sectors of the playing field.

Fig. 1 shows deployment of offensive and defensive weaponry around a player's base unit. The plus (+) signs represent anti-tank mines which have been deployed by the player. (Mines are invisible to unfriendly forces until struck by a tank.) Numbers indicate friendly tanks, asterisks represent unfriendly tanks, and Xs are disabled tanks.

Since the game is designed to be played by two physically separated people, there is a command to transmit messages to the other player, thereby allowing nasty comments to be exchanged.



The game requires two complete microcomputer systems with communications capability (RS-232) and modem or equivalent. The program, which each player must have, prompts for baud rate (between 110 and 9,600), and establishes communication with the other machine without other communications software packages. A save feature allows both players to interrupt the session and resume at the same place later. A practice mode is available to help you learn commands used in the game. It allows you to deploy your forces and inflict casualties on yourself. The practice mode does not, however, provide any opposition, so its usefulness is limited to command familiarization.

I have found two disadvantages with the game: If your machine is susceptible to crashes, be warned that there is no warm-restart capability, except from the point you last saved the game. I suggest you save the game periodically in case disaster strikes.

Also, response of the system to commands slows down significantly when communicating at 300 baud, especially when both players are busy inputting commands. (It is just the reverse of the infamous keyboard bounce problem—you push the key and nothing happens.) The response time should improve if higher baud rates are usable (in the case of 1,200-baud modems for telephone interconnect, or higher where hardwired circuits are available).

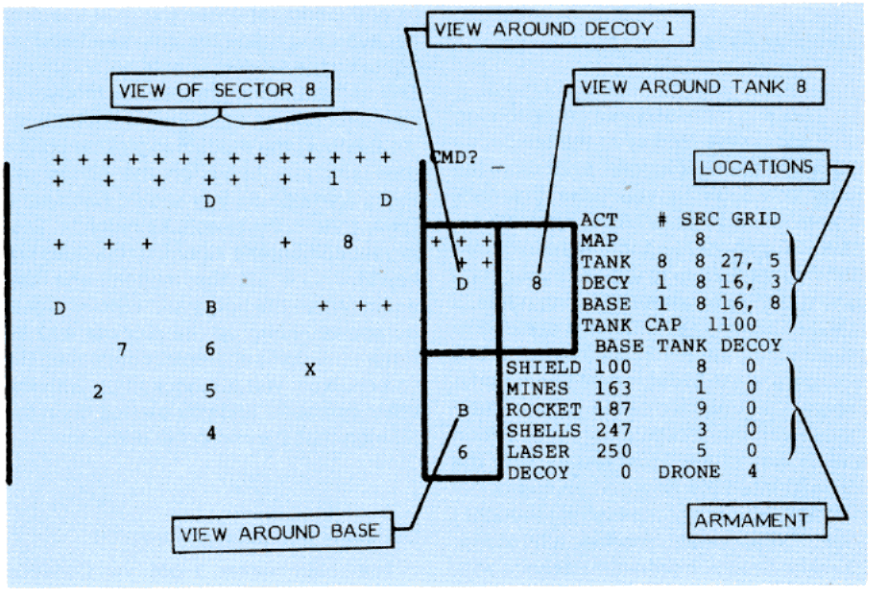


Fig. 1. Commbat Screen Display.

"If your machine is susceptible to crashes,. . . there is no warm restart capability, except from the point you last saved the game."

COMMAND	OBJECT	*FIRE CONTROL
(S)ELECT	(T)ANK	8 1 2
(D)ROP	(D)ECOY	7 * 3
(L)OAD	(B)ASE	6 5 4
(F)IRE	(M)INE	%FIRE CONTROL
(H)ELP	(R)OCKET*	S X Y
(M)AP	(S)HELL %	SYMBOLS
(:) MSG	(L)ASER *	B BASE
(P)ATCH	(A)IR RC%	D DECOY
(Q)UIT	(I)CBM %	* ENM TANK
(C)ASSETTE SAVE		N OWN TANK
SAMPLE COMMANDS		+ OWN MINE
FIRE SHELL 1 22 10		X DEAD TNK
FIRE LASER 6		# BOUNDARY
DROP MINES 3	LOAD SHELL (1)	
PATCH 2 4 5	SELECT TANK 2	

Table 1. Commbat Commands.

Commbat is written by Bob Shilling. The disk version requires TRSDOS 2.3.■

Cassette Comm
Tandy/Radio Shack
Fort Worth, TX
$9.95 Model I, Level II

by Virginia Dible

More and more services are becoming accessible by way of the telephone line and can be plugged right into the home computer. If you have the right equipment, it is possible to take advantage of CompuServe and community bulletin boards or even to log on to your company's computer without leaving home.

With all these advantages, I decided to get a modem for my TRS-80 Model I. But after getting the $149 Modem I from Radio Shack, I still needed some way to interface it with the computer. My first option was by way of the usual route—with the RS-232C Interface Board at an additional $99. (This is getting expensive, I thought.) Then I discovered another alternative: Cassette Comm, a software package written specifically for the Model I Level II computer. It was a logical alternative and my wallet agreed. It is a bit more limited than the interface, though. But, for my limited purposes, it does a good job.

Hooking up the Modem I with Cassette Comm is not difficult. I simply plugged everything in. The modem plugs into the telephone outlet, and the telephone plugs into the modem. A special cable for Cassette Comm connects the modem with the computer. The cable is inexpensive ($4.95). The cable plugs into the modem and for the moment is left unattached to the computer. The power adapter is plugged into an electric socket, and it is ready to go.

Incidently, it is impossible to get mixed up and plug the wrong thing into the wrong hole. The designers of Modem I took such mistakes into consideration and made each socket a different shape. So unless you try to put a square plug into a round hole, you will be okay. By the way, be sure the norm/cass switch on the modem is on cass. Norm is for use with the RS-232C Board. The mode switch on the front of the modem should be off.

With all the connections made, I was ready to load Cassette Comm. By entering C the program loads, and when you enter / after the next prompt, it takes you right into the program. Turn off the cassette recorder and disconnect the cassette cable at the back of the computer. This is where your dangling cable to the modem comes in—insert it where you just unplugged the cassette cable.

Now we are ready to dial. Pick up the receiver and dial as if you were making an ordinary phone call. It will ring and be answered with a single tone. This is the answering computer's signal. Without hanging up, turn the mode switch from off to orig (short for originate). You use orig because you made the call. The two tiny lights on the modem should both light up. The on light indicates that the modem is now on. The cd light (carrier detect) indicates that the modem is picking up the tone you just heard on the phone. As these lights go on, you should also hear a lower tone in the telephone receiver. That is your computer's signal. If this does not happen, turn off the modem and dial again. When the lights and second signal do appear, hang up the receiver and hit Enter until some characters appear on the screen. Now you are hooked up with the other computer and you can log on in the fashion that the computer demands.

Company Computer Connection

The main reason I got the Cassette Comm package was to connect with my company's computer and work at home. This beats driving to work for a two-hour stint in the evening. Instead I can be there in the time it takes to make a phone call.

I also enjoy putting Cassette Comm to use by calling the local Community Bulletin Board Service (CBBS). Once my connections are made, the CBBS takes over and gives instructions on how to use the bulletin board. It allows for variable factors in the originating computer, too, which made me curious about the limits of Cassette Comm.

"The Cassette Comm is set in the simplex mode, which is a one-way street."

In CBBS's menu, the user can choose to change both the baud rate and the duplex mode of the CBBS. I had to do a little research to discover what these were, but in the process I unearthed some Cassette Comm limitations.

Usually the baud rate can be changed, and the Modem I allows for any rate from 0-300. The RS-232C Board advertises a range from 50-19,200. The Cassette Comm, however, is permanently set at 300. Thus, if the computer you want to reach has a baud rate of 150, you are out of luck.

Full-duplex, half-duplex, and simplex modes have to do with the traffic of tones sent and received by the modem. If you are in duplex mode, you can send and receive messages simultaneously. It is a two-way street. The full-duplex mode also has an echo. In other words, if you hit the letter G it is sent to the computer at the other end of the line. Then it is echoed back and received by your modem and shown on your screen. Half-duplex mode omits this echo. Messages can still be received and sent simultaneously, but no echo is returned and you will not see what you have typed displayed on your own screen.

One-Way Street

The Cassette Comm is set in the simplex mode, which is a one-way street. What this means is that your modem will continue to receive messages unless you hit a key on the board. If you do this while receiving a message, your sending signal will interrupt the receiving signal and what you see on the screen will not make any sense. The other computer will have received your message, but in the meantime you will have garbage printed on your screen. Simplex mode does allow for the echo, however, and you can see on your own screen what you have typed. I experimented with this on the CBBS, which allows you to choose between full-duplex and half-duplex modes. Since I was using Cassette Comm I was operating in simplex mode, the one-way street, even though the CBBS was set up for full duplex. By selecting the half-duplex mode on CBBS, the echo disappeared , and what I typed did not appear on the screen.

Another limitation with Cassette Comm deals with the ans/off/orig switch. Usually your computer can be at either end of the telephone line. You can call another computer (in which case you would be the originator), or another computer might call you (and you would be the answering computer). The Cassette Comm package, however, only allows you to originate the call. It will not work if someone calls you.

Despite the limitations, Cassette Comm has what I needed. At one-tenth the cost, the Cassette Comm is a good little package. Without it, I have no telephone connection. With it, the area of telecommunications is just beginning to open up for my advantage. ■

Reader Service for facing page ↙53 →

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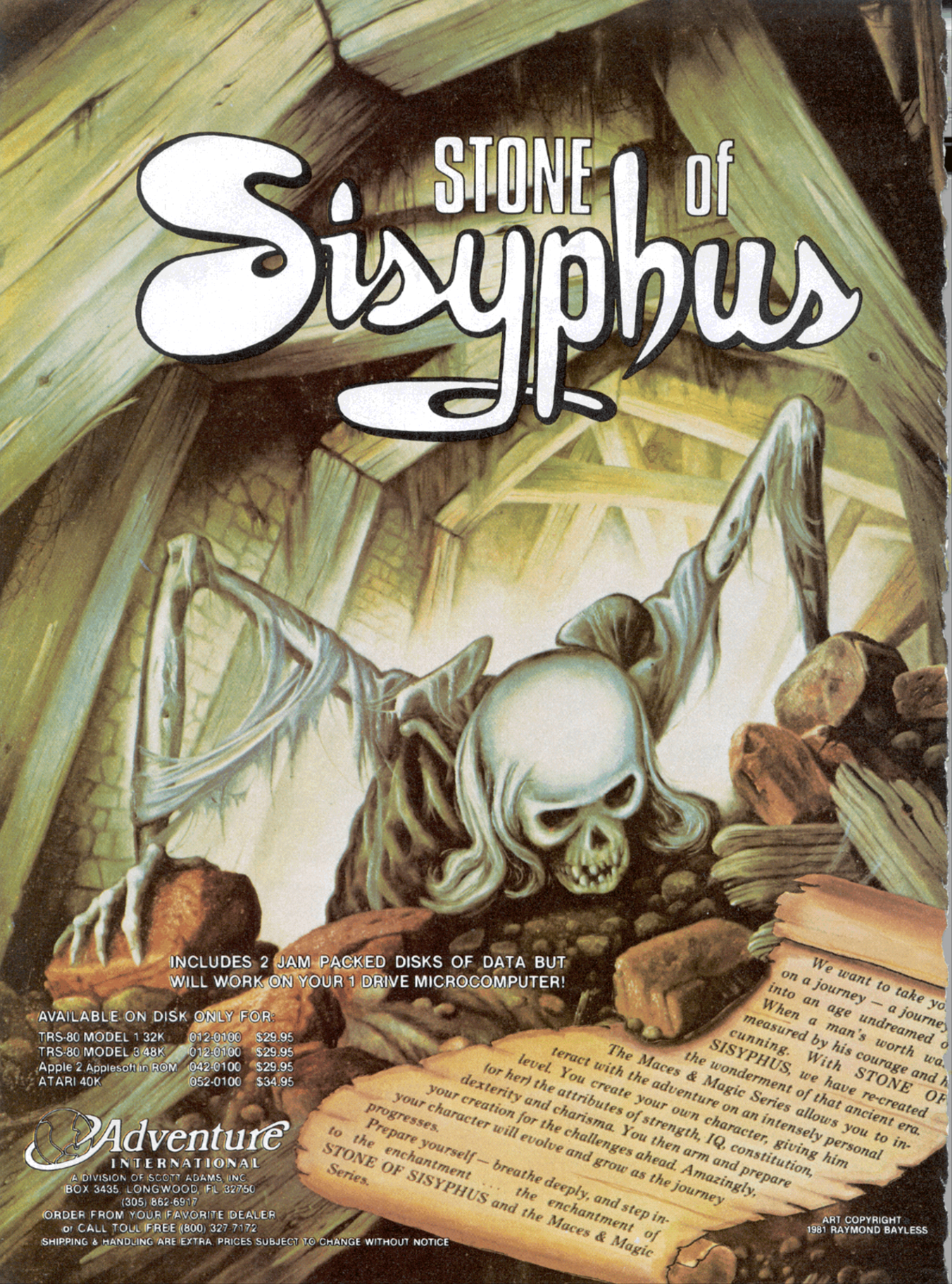
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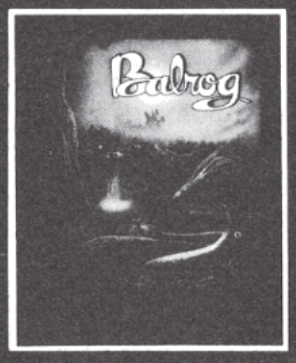
maces & magic

BY CHAMELEON SOFTWARE



BALROG

Meet the Chromatic Dragon face-to-flame in BALROG, the first in the MACES & MAGIC Series. This fantasy adventure features one of the largest data bases ever created for a microcomputer role playing game. Not only can you create completely individual characters, but you may also choose from a huge inventory of specific weapons and armor items. Freeform input combined with choices suggested by the program makes the discovery of the more secret areas of the dungeon a real challenge!

STONE OF SISYPHUS

The STONE OF SISYPHUS carries you to a 'thinking man's' dungeon, wherein you must apply your skills to effect survival and to realize your goals. This is an unfriendly subterranean world populated by hideous monsters, and dripping with fabulous treasures — the latter enticing you to face the former! Your survival hinges upon hard intellect, as opposed to the wispy uncertainty of chance, so be prepared to draw deeply from your intellectual reservoir! And — the responsiveness of the program to the individual qualities of your character make this grand adventure frustratingly enjoyable for hundreds of hours before all of its elusive secrets can be unlocked!

MORTON'S FORK

The third entry in the Maces & Magic series, MORTON'S FORK transports you into a world bereft of natural laws — a realm populated by magical beings and strange creatures. The scenario is set within the confines of an ancient wizard's fortress. Through your keyboard input, you equip your warrior with armor, weapons, and gold, as well as with desirable personal attributes. Only then will you be able to face the dangers of MORTON'S FORK! Features include multiple skill levels and a comprehensive manual describing the colorful Maces & Magic world.

MACES & MAGIC are fantasy adventures involving you and your computer. Armed only with your wits, a microcomputer, and the software provided, you can become the hero or the meal your destiny dictates. You create a character, equip him (or her) with suitable weapons and armor, and enter the dungeon in search of fame and fortune. Neither is particularly easy to obtain.

If you are successful in avoiding or conquering the various monsters, traps, enchantments and illusions set by our nefarious dungeonmasters, you may escape with riches and glory. Your name and deeds will be recorded for posterity in the records of the dungeon. More importantly, you'll be alive. You may then use the same character in his more experienced and wealthy form when you enter dungeons on later occasions.

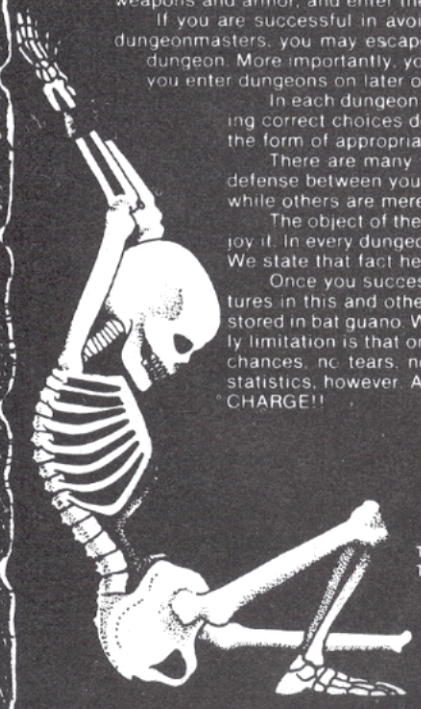
In each dungeon there are random events which occur, but in the vast majority of cases the skill of the player in making correct choices determine the outcome of the game. The majority of instructions are furnished within the program in the form of appropriate prompts.

There are many ways to meet an untimely demise in the dungeon. Monsters and such are just one of the lines of defense between you and the treasures stored there. Various traps await the unwary (and the wary too). Some are lethal, while others are merely unpleasant or inconvenient. It pays to be suspicious. Beware of orcs bearing gifts.

The object of the whole exercise is not just to fight the monsters and collect treasure. You have to get out alive to enjoy it. In every dungeon there is at least one exit. It is possible to escape from each and every dungeon with a whole skin. We state that fact here because players often believe this not to be true. We really aren't out to get you. Not really.....

Once you successfully exit from the dungeon you will have an opportunity to save your character for further adventures in this and other dungeons. Your treasures will be converted to their gold equivalent and your weapons and armor stored in bat guano. When you start another adventure, you may call up your experienced character for another trip. The only limitation is that once a character is killed, he may re-incarnated three times, after that, he is gone forever. No second chances, no tears, no breast beating. Gone. Kaput. Finished. You will have the distinction of adding to the dungeon statistics, however. A sort of second hand immortality in recognition of a nice try. No glory or cash though.

CHARGE!!



Maces & Magic Series

By Chameleon Software

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requires 2 drive system

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← Reader Service for facing page ↙222

Microcosm III
Basics and Beyond, Inc.
Amawalk, NY
$24.95

by Carl A. Kollar K3JML

The ad from Basics and Beyond advertising "20 programs with sound—each as good as our competitors' $15 and $20 programs—for $24.95" seemed a bit hard to believe. Microcosm III sounded interesting and the inclusion of sound in all of the 20 programs made it all the more enticing. I decided to purchase this software.

First impression is very nice. Microcosm III consists of a vinyl binder with molded spaces holding two cassettes on one side and a pocket for the documentation (neatly printed) on the other side.

The Programs

Computer Composer is a tutorial dissertation describing and playing various types of computer music—actually only random tone variations. I found this to be of questionable value.

Long Division is a step-by-step tutorial in long division. Four degrees of difficulty can be chosen. The highest level involves a four-digit number divided by a two-digit number. The number of problems per series is selectable. A score is given at the end of a series. Tones are used to cue and reward. The characters involved are drawn large on the screen. This is worthwhile if you've got school-age kids or need brushing up yourself.

Similarly, Multiplication is a step-by-step tutorial in multiplication with five skill levels. The hardest requires multiplication of a three-digit number by another three-digit number. Tones and graphic characters are used identically as in the long division exercise.

Typing Tutor supposedly offers 1 to 54 drills. I couldn't get off of lesson one, meaning either lousy typing on my part or a bug in the program?

Cliffhanger is a cute two-person computer version of the familiar game of Hangman. The first person enters a word to be guessed into the computer, and the second player tries to guess a letter in the word and ultimately, the word. A little man throws the letter you chose over a cliff. If the letter is in the secret word, it lands in the right spot in the space representing the word. If not, they fall into the ocean. When you win, it is proclaimed by the TRS-80. When you lose, the ground beneath the little man's feet breaks away and he falls. A lousy version of Taps is then played in his memory. It is a good game. However, the letters you already chose are not displayed.

Crossword Puzzler generates crossword puzzles for two categories—animals and sports. If you modify the program as instructed, it allows you to enter your own words and definitions to generate a crossword puzzle of any category. It is the kind of game crossword fans will find interesting.

Key Sound lets you thrill and amaze your friends with the sound of a click each time you press a key—hardly worth the time to load.

"I do not agree . . . that each of these programs was worth $15 to $20."

Computer Organ sets up the computer keyboard so that someone familiar with playing an organ or piano can play a tune. Includes keyboard graphics indicating which note is being played.

Children's Hour includes three length-selectable children's games: Guess, guess a number between zero and any chosen limit; Last Match, Nim, with options to choose number of matches, number of points needed to win and maximum number of matches that may be taken per turn; and Rock, Scissors, Paper, the familiar game with cute graphics.

Message Marque is another worthless program. Type a message and gaze in wonderment as it crawls across the screen in giant format. Capital or small letters can be chosen. The novelty wears off in about .3659 microseconds as the message literally crawls across the screen.

Gunfight displays a duel between two player-controlled cowboys with an obstruction between them. Graphics are very slow. It is hard to win unless the other guy makes a mistake.

Seige is a graphic adventure-type game in which you must rescue your captured king who is being held in his castle.

Pinball is the only machine-code game in the series with very fast graphics with a spinning pinwheel and assorted other goodies: various bleeps and bloops as the ball bounces around. This is the most worthwhile program of the series.

Knockout displays six rows of bricks on the left side of the screen. The object is to knockout all the bricks by hitting them with a bouncing ball. You rebound the ball by controlling a paddle that moves up and down the left side of the screen. It has fast graphics for a game written in Basic.

Soccer is another version of the popular game. You've probably tired of this one years ago.

Instant Replay is a TRS-80 version of Simon Sez. The computer plays a random series of tones. You must replay these tones in exactly the same order using the keyboard. The computer adds another note until you fail to duplicate the series correctly. A score is given at the end of a series.

In Monster Chase, each program run produces an original maze made to your specifications. The object is to get out of the maze before a dumb monster gets you. You would have to be the one that is dumb if this monster catches you. The monster does not methodically track you but randomly wanders about.

Shootout is a cowboy and renegade shoot it out. The renegade (controlled by the computer) mostly hides behind the obstacle. It is very difficult to get a clear shot.

Submarine lets you try to sink ships through a periscope view. It has very nice (and quick) graphics with ships that fight back and try to sink you with depth charges.

Battleship is a computer version of the popular paper and pencil game with a selectable size grid. The computer goes after a kill when two portions of your ship are found. This game can be played against another person. It is enjoyable to play but, unfortunately, if the computer wins, it does not show you where its ships were placed—very frustrating when you have been unable to find them during the game.

I do not agree with Basics and Beyond that each of these programs was worth $15 to $20, but at least four were worth $15. Those are Pinball, Submarine, Knockout and maybe Battleship. Others that might be worth $10 are: Crossword Puzzler, Computer Organ, Children's Hour and Seige.

Even if, as I suggest, a little less than half of these programs live up to Basics and Beyond's claim, you can wind up ahead. For $24.95 it is still a good buy. ■

Electric Spreadsheet
Dan G. Haney & Associates, Inc.
San Mateo, CA
$34.95 16K Model I and III cassette
$64.95 32K/48K Model I and III cassette
$67.95 48K Model III disk
Exatron
Sunnyvale, CA
$49.95 16K/32K/48K Model I Stringy-Floppy

by Mark D. Goodwin

Electric Spreadsheet allows the TRS-80 to become a large worksheet. You can easily perform many complex calculations in integer, single-precision or double-precision number representations. Electric Spreadsheet comes in many versions. The version I will discuss in this review is for the Exatron Stringy-Floppy.

I am an accountant and for quite awhile I have heard much about the virtues of VisiCalc. But lacking a disk system I haven't been able to use this computer worksheet system. Recently I spotted an Exatron ad which offered a similar program called Electric Spreadsheet for only $49.95.

A 20-foot wafer contains the Electric Spreadsheet program. When I saw the size of the instruction manual which comes with Electric Spreadsheet I nearly fainted. It was large and impressive. Also included are instructions for backing up Electric Spreadsheet. At this point the reader should note that if you want to use Electric Spreadsheet for a 32K or 48K computer you must purchase a special program called @FREEZE. @FREEZE is available from Exatron for $9.95.

"I would rate everything about this package excellent."

Once I was able to catch my breath from the size of the instruction manual, I proceeded to make a backup copy and then ran the program. The first option presented is the number type you wish to use. As I stated above Electric Spreadsheet can use integer, single-precision or double-precision number values. Next you enter the number of columns and the number of lines the worksheet will contain. Now you can select a standard one-page format or you can use multiple pages. If you choose the standard one-page format there is nothing left to do. If you choose to use multiple pages you must also select the number of spaces for line labels and the number of spaces for columns. Then you are asked about decimal places. All the columns can have the same decimal places or you can specify how many decimal places for each column.

Page one of your worksheet will now be displayed. You can easily move around the worksheet by using the arrow keys. You can change pages by pressing the at (@) key. You will then be asked which page you want displayed. You can prepare the output at anytime by pressing the question-mark (?) key. Also you can go to the menu by pressing the slash (/) key.

Once in the menu mode you can do the following: output to screen, output to printer—after screen output, input to screen, input to printer—after screen input, change the format, save all the data to a wafer, find out how much string space is left, or you can just quit.

I have used Electric Spreadsheet for about two months now in my accounting business. I have found it quite useful and worth the price. I would rate everything about this package excellent. It is worth the asking price for the superb documentation alone.

I have only covered the Stringy-Floppy version of this program in this review. I can only assume that the other versions are just as good as this one. From reading the ad, the disk version gives even more calculations than the Stringy-Floppy version.■

BasicPro
Softworx, Inc.
Seattle, WA
$24.95

by Joel Benjamin

We often have to pay a large price in money, time and effort for the aid cassette utility programs provide, especially if we have to decipher their instructions, load them in, and use them separately.

We definitely need one program which can change variable names, renumber, compress and do other often needed tasks. Softworx has provided us weary programmers with just such a cassette utility program. They call it BasicPro.

BasicPro is a cassette-based, machine-language utility program which runs on a 16K TRS-80 Model I and Model III. It places at the user's disposal a variety of useful programming and debugging aids including the following capabilities:

- Renumber or copy statements
- Rename variables or line references
- Produce a cross-reference list of variables and line references
- Locate variables or line references
- Compress a program
- Recover a program that has been "New"ed
- Merge two Basic cassette programs

The designers of this comprehensive package have succeeded in making it very easy to use. To begin with, the documentation could well serve as a model of clarity and logical organization. It helps you use the program and, although this may seem self-evident, such is often not the case. The documentation booklet is easy to read and it is also easy to refer to because of its table of contents and its clever use of indenting, spacing and underlining.

BasicPro is loaded into memory with the use of the System command; then the Basic program you are working on is loaded or entered. The commands all have a simple and logical syntax. Each of them consist of a slash and one capital letter followed, when necessary, by the appropriate parameters.

Once BasicPro is loaded into memory, it remains there with all its capabilities ready to access through these simple commands. You don't have to load and save, load and save, as you would with separate utility programs. And if, perchance, you issue a command that requires memory beyond the capacity of the computer, an appropriate error message appears on the screen. If you issue an invalid command, or if you Enter /H, a complete list of BasicPro commands and their functions is displayed. Every base certainly seems to have been covered by the program designers. I have found it a pleasure to work with and I highly recommend it to any programmer who wants to spend more time writing programs and less time fretting over the diverse procedures necessary to operate separate utility programs.

Congratulations to Softworx for placing on the market such a useful and easy-to-use utility program at a reasonable price.■

Continued on page 51

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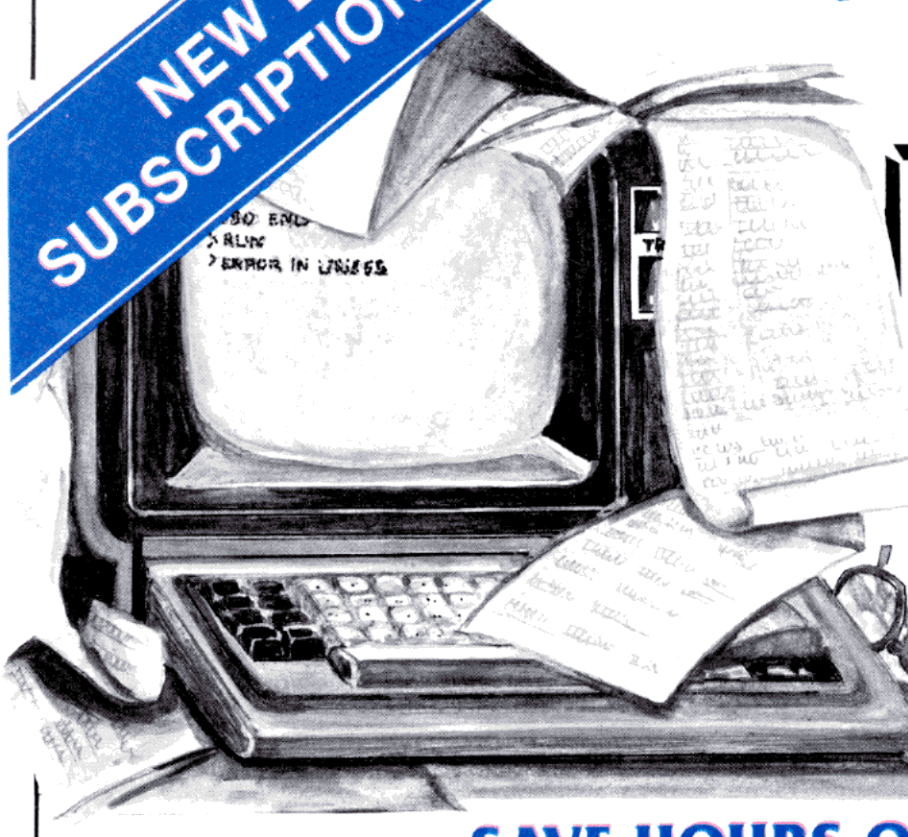

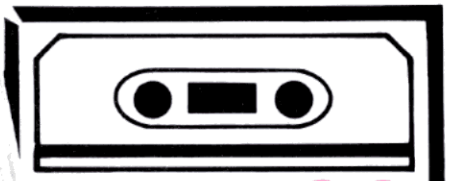

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Wayne Green

Wayne Green
Publisher, *80 Microcomputing*

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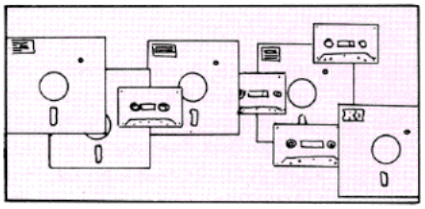
 Continued from page 49

Attack Force
Alpha Products
Woodhaven, NY
$17.95 Disk
$15.95 Cassette

by George Kwascha

Attack Force is a machine-language version of the popular video arcade game that transforms your TRS-80 screen into a maze of hostile alien ramships and flagships. As you start each game, a convoy of eight ramships, cruising at flank speed toward your ship, appears at the top of the maze. It is up to you, firing missiles, to manuever and outflank the ramships before they ram you.



Each game provides you with three ships. In addition to the pesky ramships, you must contend with the more deadly flagships. These destroyers roam up and down along the sidelines of your screen, waiting to join the action. Their moment comes when you destroy the last ramship.

As the game progresses, they tend to get over-anxious and pop out unexpectedly. To make the game more challenging, sidelined flagships will use their laser bolts to transform a ramship into a flagship or, to add to your frustration, into a mirror image of *your* ship! Firing at or colliding with the mirror image destroys your ship.

An extra 1,000 points is awarded for decimating the first wave of alien ships, an extra 2,000 points for the second, 3,000 for the third, and so on. If you are lucky enough to score 10,000 points, you are awarded an extra ship. Each successive 10,000 points allows an additional ship. But each wave of unfriendlies becomes more difficult to vanquish. Action picks up as more flagships are created, moving at greater speeds.

Warning! Running away will not prevent your demise. Your only salvation is to meet your foes head on with your wits in gear and your finger on the fire button! A word of caution—you must be aware that your ship can only fire one missile at a time. Successive missiles do not fire until the preceding missile obliterates its intended target or crashes into oblivion off the screen. This can be a vital factor in later stages of the game. The point values of enemy ships increase as each wave of invaders is annihilated.

Arcade-Style Realism

Your ship's motion is controlled by the arrow keys, and missile firing is by either the "@", "F", or the spacebar. If you shell out the cash as I did and purchase Alpha's joystick, you get the exquisite pleasure of enjoying Attack Force to the limit of arcade-style realism. The joystick will plug into either a 16K unit or the expansion interface.

This game produces noises that make battling aliens a delight to the ears. A little hardware rigging is required, however. As a typical hobbyist, I had to burrow into the depths of my boxes of electronic junk to come up with a one-watt audio amplifier, a one-watt speaker, volume control and a nine-volt battery.

Sound came with every fired missile and each exploding alien ship. Musical sound came with the start of every game and each addition of 1,000 and 10,000 points.

Shortcomings? Well, no review is complete without a critical comment and I have no intention of breaking with convention. My one complaint stems from my inability to keep track of how many ships I have left. After perspiring through waves of enemy vessels, I find it difficult to recall how many of my three original and extra bonus ships have been destroyed. A screen display of this information would have been helpful.

Have you ever observed arcade games as they sit unoccupied? They automatically play the game, attempting to attract passersby. The ingenious authors of Attack Force did not overlook this feature. After several minutes of inactivity, the TRS-80 screen automatically goes into action, like the best of the video arcade games.

The game allows one or two players on the field of battle. The disk version will store the highest 10 scores with the appropriate player's initials in a permanent file. During play, the top of the screen displays the current score on the left and the highest score in the file in the center. This is an outstanding feature, allowing you to compete for higher scores. After countless hours of battle, my calloused fingers totaled my best score at 45,560 points. Think you can beat that? Try Attack Force and you will be pleasantly surprised.■

Modem I
Tandy/Radio Shack
Fort Worth, TX
$149

by Richard C. McGarvey

Radio Shack has brought out a new product, the Modem I. The Modem I is the first direct-connect modem available from Radio Shack, and it has some great advantages over the competition. At less than $150 the biggest advantage is price.

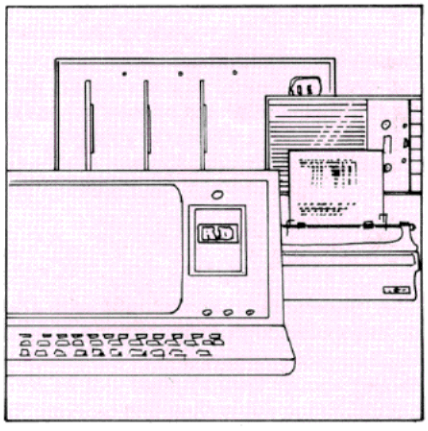
Most important to the small computer owners, the Modem I works from the cassette port with no RS-232C to add. No expansion interface is needed and since the computer acts as a dumb terminal, there are no minimum memory requirements. You can talk computer to computer without any expansion. If you have the E/I and RS-232C you can go that route too.

Connection

The Modem I uses a modular phone jack to connect to the phone lines. If you have your phone near the computer you can plug the phone into the modem, the modem into the wall jack and away you go. Use the phone normally when not on line with another computer. If you are on line with another computer the modem takes command.

Operation

The Modem I has both answer and originate modes. That means that you can call



another computer or computer network such as CompuServe. Since you originate such a call you are in the originate mode and the other computer is in the answer mode. If another computer calls you, you go to the answer mode. Either way you

Continued on page 326

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THE EXCLUSIVE ORACLE

by Dennis Kitsz

"At my current electrical rate, that's about 43 cents a week. . ."

Q. When I last heard from you (May), we were both unable to use the Exatron Stringy-Floppy at high speed (50 or 100 percent faster than normal). In the August 1980 issue of *80 Microcomputing*, Earl Savage talks about the ESF and says, "Further, I have experienced absolutely dependable operation with the speed-up option. . ." What has he got that we don't have? Sitting on top of my monitor are four Stringy-Floppy wafers where I can't find the beginning of tape. @NEW runs indefinitely. Any thoughts?

Ralph Nottingham
Deerfield Beach, FL

A. I had about given up using the ESF at high speed myself when I by chance had to reconfigure my system for a demo. I took along only the keyboard unit, the video monitor, and the Stringy-Floppy. Surprisingly, it worked just fine at high speed. This is what I've found: Most copies of Versions 1 through 4 of the ESF operating system were programmed in erasable memories (EPROMs) with a 450nS access time—adequate for normal speed but marginal for faster speeds. Because of advances in EPROM technology, the newer 450nS EPROMs were able to run at the 50 percent speed increase, but not when plugged into the expansion interface bus with a buffered cable! The buffered cable added some delay to the system's memory access.

Furthermore, the unit I have is sensitive to its position with respect to the computer, flaking out when too much electronic noise is present. I have to keep it out of the way of the disk and printer cables and video monitor transformer. It works best parked right behind my keyboard, in front of the expansion box.

The new ESF units seem to have solved the speed problem, though. Version 4.1 is the "final" version, and to prove it Exatron has programmed it into a masked ROM (in a black plastic package). This ROM has a faster access time, and I have run the unit reliably at 3.5 MHz. If you get the latest version of the operating system from Exatron and plug the unit between the CPU and expansion box, your problem should be solved.

Q. I understand that heat build-up in a microcomputer can, will, or may cause degradation of data. Am I correct? Is there a heat build-up over time that the novice TRS-80 operator should be concerned about? Over three to five hours? Over 24 hours? Over days? I can recall leaving one program that I was working on in place for nearly a week. Is there any greater heat build-up if the novice upgrades a system to 32K or 48K? Should the owner become concerned about data fudging or fans after upgrading? How about disks, or peripherals such as a printer? If a computer is left on around the clock for several days, how much electrical power does it consume? The specs for the Model III seem to call for both or either 105/130 VAC (whatever that is) and 240/220 VAC (whatever they are), as well as .83 amps RMS (whatever that is). Volts and amperes I know, but VACs and RMSs I don't. How much power does a TRS-80 consume, as one might measure it against a 100-watt light bulb? Finally, what about turn-on shock as contrasted to long-term burn? A technician with General Electric once told me that the shock of turning on a light bulb took as much off its life span as 24 hours of burn. Any similar tradeoff in the computer?

Jay Chidsey
Green Springs, OH

A. Yes, heat can cause electronic parts to burn up over time, though TRS-80s are "burned in" for heat and electronic sensitivity for a continuous 100 hours before shipment. But the answer to your question is more complicated than that. Electronic parts are derated with respect to temperature at 25 degrees Celsius. This means that as temperature varies from this figure, their reliability changes. Temperature derating charts are provided by the manufacturers of specific integrated circuits. However, the parts inside the TRS-80 are guaranteed to work properly within the range of 0-70 degrees Celsius (32 to 158 degrees Fahrenheit). In other words, since scalding water is 140-150 degrees Fahrenheit, if you touch the parts (and are not a mystic), they are probably running within operating temperatures.

This isn't a complete answer, though. Some parts within the area of the power supply pass transistor (on the Model I) get warmer than others. If the unit is covered, set on a soft surface (like a plush rug), or ventilation is otherwise prevented through the slots in the case bottom, the temperature of some parts may exceed the operating limit. All TRS-80s have been designed to operate properly with normal convective ventilation. My own unit (except for the video monitor) was on continuously for nearly a year without failing.

There will be greater heat build-up in the expansion interface of the Model I and in the Model III case when memory is added. This is normal, because the operation of the parts themselves gives off heat. In warm and humid areas, the heat build-up in the Model I expansion interface can be excessive, especially since two power-supply transformers are housed within it. This may cause occasional heat malfunctions (mostly in the power-supply section and not in the logic area). In humid areas, corrosion around screws holding power supply parts in place will be more of a problem.

Disks, printers and other peripherals make peripheral driver chips do some work, hence a little more heat. But, there is no need to be concerned about heat build-up in any TRS-80 computer except under the most unusual environmental conditions (not likely in Ohio).

To calculate power consumed (watts), multiply voltage times current. Thus, a Model III TRS-80 is .83 Amps RMS (root-mean-square, used to indicate current demand in ac circuits, shorthand for "true current demand") and 117 VAC (volts alternating current—ordinary house current) consumes .83 × 117 = 97.11 watts. . . just about the same as a 100-watt light bulb. At my current electrical rate (2.6 cents per Kilowatt-hour), that's about 43

cents a week if I keep the unit on continuously. Most of the Model III power is consumed by the video monitor, so my Model I (with its separate monitor turned off) is more conservative than your Model III, and will cost only about 15 cents a week.

Finally, turn-on shock is not normally a problem. Certainly there are turn-on transients which are much higher than the usual running voltage, but these are absorbed by a combination of the power transformer, the diodes, filter capacitors and voltage regulators. On the Model I, virtually none gets to the parts themselves; on the Model III, with its switching power supply (see *Byte*, November 1981, for more details), the results are even better.

Q. I would like some additional information concerning some disk-drive problems you covered last August. Where can I get the lubricant you recommended for disk drives, Break-Free CLP? I have been unable to find it in New Orleans. Can you provide additional descriptive information to positively identify the points on the disk drive to be lubricated? According to Radio Shack, the disk-drive terminating resistors should be in the last drive on the cable which, with the Radio Shack cable, is the high-order drive. Since you have stated in more than one article that these ICs should be in drive zero, I wonder if you can resolve this question for me.

Paul A. Bartmess, Jr.
Metairie, LA

A. Break-Free CLP is a Teflon-based lubricant manufactured by San/Bar Corporation, P.O. Box 11787, Santa Ana, CA 92711. Write to them for the distributors in your area.

Remember that I said the technical manual for the disk drive had no recommendations about lubrication. Unless you believe you have a problem, don't do it. That said, here are the five points and how to find them. Remove the disk drive case cover and set the drive in motion. Observe that somewhere (probably on the left side) there is a motor which turns a metal band. This steps the disk head; it is usually protected by a plastic window. Turn the power off, remove the window and apply a drop of lubricant to the point where the band contacts the stepper motor shaft. *Very carefully* turn the motor shaft by hand several times until the lubricant is distributed on the band. Wipe it clean.

To get at the guide rails, remove the logic board. Unplug all the connector cables—they should be labeled to match the logic board, but mark them if they are not—and remove the screws holding the board in place. Gently lift the logic board out and rest it against the case. Two heavy, horizontal metal rails should be visible immediately above and below the center disk support cone. If you still aren't sure which these are, move the stepper motor shaft again by hand. A plastic collar holding the read/write head assembly will move back and forth along these rails. One drop on each rail, move the stepper shaft to distribute the lubricant, and wipe clean. *Don't* touch the head assembly with hand, cloth or lubricant.

Now open and close the drive door. There is a pressure pad assembly across from the read/write head which moves when the door is opened. If you have a double-headed drive, this will be another head instead of a pressure pad. Observe how the door, together with the motion of the stepper motor, forces a plastic cam or guide against the pressure pad assembly to hold it in place. As the head moves, the pressure pad follows it. The contact point between the pressure pad assembly and the door closure assembly receives a great deal of horizontal motion, and will wear and may grind. Apply a drop of lubricant here, move the door and stepper motor shaft, and wipe clean. Again, stay away from the pressure pad itself or the read/write head.

Now replace the logic board and all the parts on the drive except the cover. The main drive motor for the disk can be identified because its shaft holds a cloth drive belt in place. The main drive motor is usually at the back top of the drive and spins very quickly. If there is a lubrication point on this motor (there is on mine) give it a drop of lubricant. Make sure none gets on the cloth drive belt. Let the drive run (10 POKE 14304,0 : GOTO 10) and the lubricant will work in. Stop the drive and wipe any excess off.

Clean and dust with a brush, double check that everything is in good shape, and replace the cover.

Radio Shack is technically correct on those termination resistors. They should be in the last drive used on the cable because that is the point of termination. Since the distance between drives isn't very great, it won't make a lot of difference, but the Shack is correct on that one. I can be sloppy with my own system sometimes, and that is a good example. (Of course, the only time I have more than one drive is when I'm fixing somebody else's. . .)

Q. First, I know practically nothing about electronics components and their assembly—I've never soldered anything smaller than half-inch copper pipe. Recently I bought the Tandy RS-232 board for my Model I Expansion Interface. When I saw the nature of the connection I began to dimly remember things heard and read about the reliability of the connection. First, there is no ventilation in the compartment, so heat could build up and flex the board. It also seems that the pressed—not inserted—fit should be prone to problems. Could a wood router be used to carefully rout ventilation slots? There must be a right-angle connector that could slip on the edge of the board and press into the built-in connector. Or could a short ribbon cable be built with better connectors? How can I anchor the board so it will not float around in the compartment?

James Cerny
Rochester, NH

A. Yes, ventilation would indeed help. I have cut slots in mine, but I'm bad with copper pipe and wood routers, so I used a jeweler's saw, hot razor blade, and file to do the cutting and trimming. The board does flex because of the heat, and the contacts corrode, too.

I've not been able to solve the problem of the connection itself. I tried bars and washers and all sorts of gizmos to hold it there, but I still get "RS-232 fault" messages at about two-week intervals (can almost set my baud rate by it. . .). Adding a ribbon cable is something I'll not venture. These connector pads are 1/20-inch apart—half the distance of the edge connectors on the rest of the system.

My own method is to keep the screws out of the cover at that point, remove the board regularly, vigorously buff the contacts with paper until the solder is shiny, and reinstall the board. I would be anxious to publish better solutions than this—readers?

Updates

From John A. Varela, McLean, VA: Regarding your response to Sgt. Terry L. Kuns (October), I also have one of those early CPUs that doesn't step the Data pointer properly. An alternative to the

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POKE that you suggested is to put an Input statement before the first Read. That explains why Sgt. Kuns sometimes has trouble with his Read statements and sometimes they work perfectly.

The resistor cure for the video squirm problem (October) was not R???. That little gem got past editors, typesetters and proofreaders. It was my message to myself to fill the spot in later. The real resistor please stand up—R14 it is.

I received a note from a gentleman who tried to install the twisted-pair modification in his new expansion interface. Readers please note that the new expansion interface (with the memory chips arranged horizontally toward the back) does not need and *cannot use* the twisted-pair mod, nor can this newer model be used with the buffered cable.

Readers whose questions haven't been answered, please have patience. I respond to the most widespread questions in this column, but I attempt to answer all letters—*only* if they contain self-addressed, stamped envelopes (two international postal reply coupons outside of U.S., Canada or Mexico), and if they aren't requests for custom programming or circuit design. Questions like "How can I adapt SCRMBLIT/QED to my version 3.5-1/2 of IRKDOS with zaps #43 and 55" will be answered after I start receiving Social Security.■

Desperate? Send your questions on Model I, Level II, TRS-80s to: Dennis Bathory Kitsz, Roxbury, Vermont 05669

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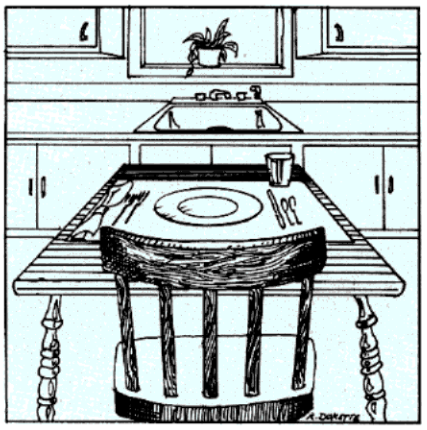
News From KITCHEN TABLE SOFTWARE, INC.

by David Busch



Kitchen Table Inc. has risen from oblivion to near-obscurity thanks to rapid acceptance of its fictitious hardware and software products including the TLS-8E microcomputer, DROSSDOS 1.1 and WORD WHACKER.

However, no one has been able to secure an interview with the introverted founder of KTI, Scott Nolan Hollerith—until now. In the past, I have attempted to protect Hollerith's identity by referring to him as a KTI spokesperson, disguising his name (Surprise! Nolan is not his real middle name) and refusing to reveal where KTI is located. So when Hollerith agreed to an interview, I packed my tape recorder, put on my best Morley Safer suit and headed for Atwater, Ohio.

80 Micro: What's the latest word from KTI?

Hollerith: Ugh.

80 Micro: Ugh?

Hollerith: User's Group Hotline. By dialing a toll-free 600 number, TLS-8E users can find out where their next group meeting will be held. When we get two TLS-8E users living in the same state, we hope to get some groups going.

80 Micro: What's a 600 number?

Hollerith: That's where the call is billed to a third party of your choice without their knowledge. That way, neither of us has to pay for the call.

80 Micro: What can you tell us about the architecture of the Z79A microprocessor chip?

Hollerith: The what?

80 Micro: I saw that question in *Byte* and it looked important. I just repeat what an expert tells me and it looks like I know what I'm talking about.

Hollerith: Me, too. I don't have much of a background in hardware. Back in the days when home systems were built only by homebrew hackers...

80 Micro: Yes, our Jewish friends...

Hollerith: Homebrew, not Hebrew! Anyway, most early micro executives had hardware experience. Then Radio Shack, Apple and Commodore introduced plug-in systems and companies flourished around software wizards. I'm part of a new breed—a breed with a solid grasp of neither.

80 Micro: I've seen the programs you've written. I believe you.

Hollerith: I'm not alone. Look at Radio Shack. There are only four people in the company who understand computers... and one of them is a store manager in Columbus, Ohio.

80 Micro: What is your background?

Hollerith: I grew up in Tustin, California. Like many Californians, I attended junior college for two years to get a solid high school education. After receiving a degree in slide rule design from the University of California at Phoenix, I began marketing my wife's macrame houseplant holders. When they became too complex to design, make and market, we decided to do something simpler—computer programming.

80 Micro: Then you wrote DROSSDOS 1.1?

Hollerith: I tried a check balancing program first, but it was too difficult. The nice thing about writing a DOS is it takes a pretty sophisticated programmer to figure out you screwed up. The average computer user will assume he is at fault when something goes wrong.

80 Micro: Haven't you only sold 500 copies of DROSSDOS?

Hollerith: We only planned to sell 100. We figured that would be enough to get the DOS widely circulated. Apparently, the program pirating network is less developed than we thought.

80 Micro: You encourage program pirating?

Hollerith: That's right. We make our money marketing zaps for the programs. The documentation for DROSSDOS has more than 4,000 deliberate errors.

80 Micro: You've just revealed a trade secret!

Hollerith: That's okay. Starting next month DROSSDOS 1.1 will be given away free with each subscription to my new magazine, ZAP. KTI has marketed more than 40 programs that don't work properly. Computer owners pirating those programs have probably $10 to $20 in disks and tapes tied up in them. A $15 subscription to ZAP is a small price to pay to get the programs working. And don't forget TLS-8E hardware and software mods. Did you know by entering POKE 16289,4, you can keep static electricity from attracting dust to the monitor screen? And POKE 17333,255 will turn the computer off without unplugging it?

80 Micro: What products do you have in the works?

Hollerith: A small business machine we call the TLS-8E Model II. It's basically a Model I with eight-inch disk drives and a better finished case. We got the idea from Radio Shack. They're really innovative along those lines.

80 Micro: Any other new products?

Hollerith: The FCC, at our request, is investigating the high amounts of RF radiation emitted from the Model I. We hope it'll revoke our import license so we can begin marketing the Model IV.

80 Micro: Model IV? What happened to the Model III?

Hollerith: Don't ask. Anyway, I've been out of hardware and software since the business made its second million and I was able to hire the kind of staff I've always wanted—women.

80 Micro: Then you don't have problems finding good people?

Hollerith: On the contrary. It's difficult finding good technicians. We have eight of them working full time replacing fuses under the TLS-8E's one week full warranty. Programmers are another valuable commodity. We keep 50 on staff at all times because they can work only during recess.

80 Micro: Have you been pulling our legs? Should we believe everything you've been telling us?

Hollerith: As sure as there's a TLS-8E I've been telling you the truth.■

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Even if you have one of the other versions on the market, you'll still consider this program a MUST for your collection.

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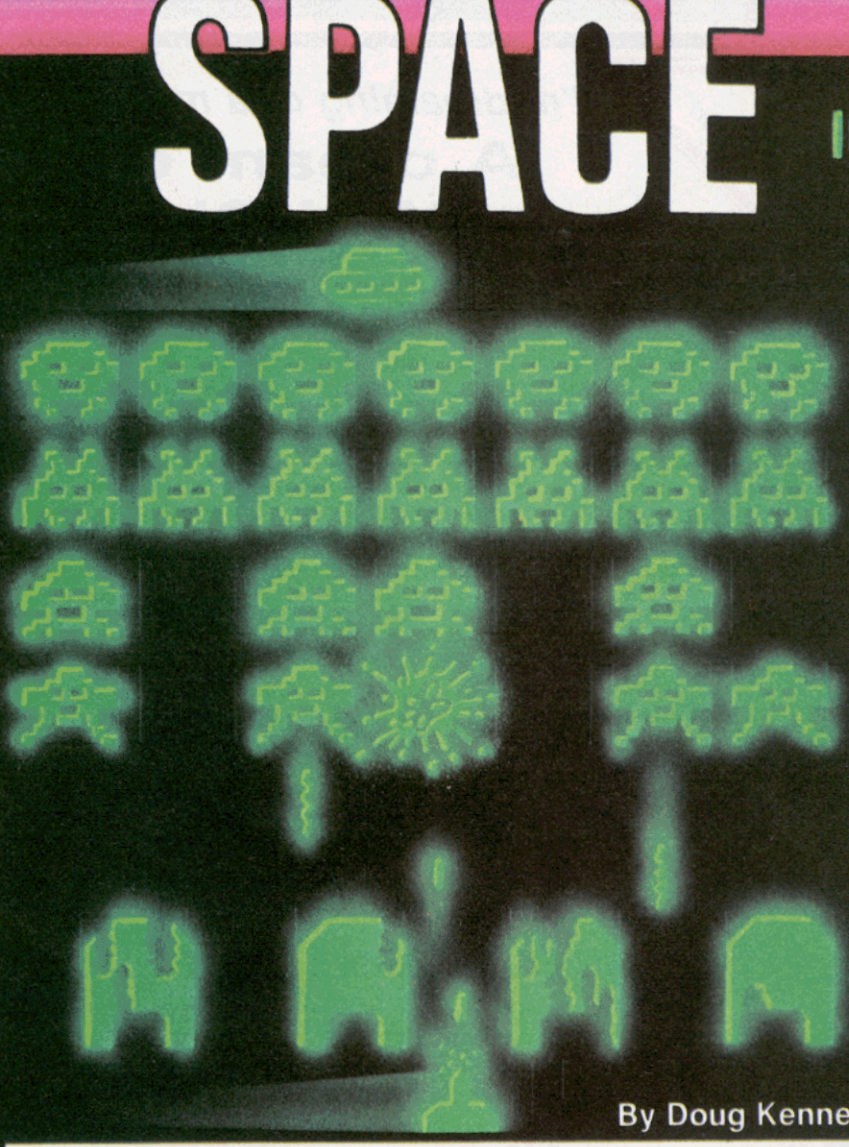

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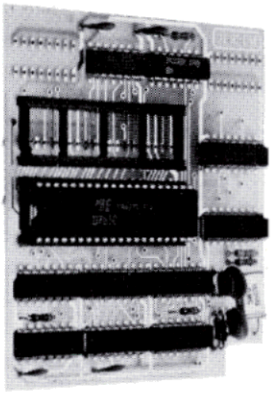

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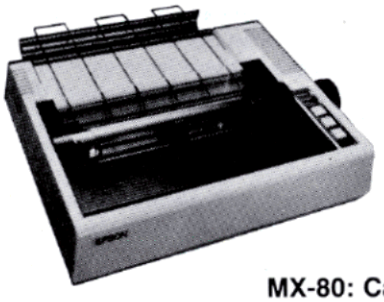

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See List of Advertisers on page 402

The proletariat plugs into the information revolution.

Videotext for the Masses

Michael E. Nadeau
80 Microcomputing *staff*

Videotext is big stuff in computer and some business circles, yet surprisingly few others know about this communications revolution and even fewer understand it.

Videotext is the interactive (the user may send or receive) transmission of words or graphics by phone lines, cable, satellite or broadcast tv. A videotext system consists of a data base and a group of terminals placed anywhere within the limitations of the transmission medium used. Data bases contain anything from recipes to stock market quotes.

To access a phone-line-based data base you need either a computer or videotext terminal and a modem. A modem translates coded data from the phone line into something understandable to the computer or terminal. Videotext systems using other transmission media usually have a means of access within the terminal itself.

Business looks to videotext as an economical alternative to the mail and phone. (See *80 Microcomputing*, December 1981, for an article on electronic mail.) Many large businesses set up their own data bases and subscribe to commercial data bases such as the Dow Jones Information Services, Tymnet and CompuServe.

Because business provides the financial thrust for videotext development, most videotext networks cater to business' needs. But what does videotext have to offer the average citizen?

Videotext for the Home User

Not everyone owns a microcomputer or videotext terminal. Micro owners do not usually buy one just to access videotext data bases; terminal owners usually have a specific need for videotext. But two types of videotext are of interest to the home user: commercial data bases and bulletin boards.

CompuServe, The Source, Tymnet and the Dow Jones Information Services are among the most popular commercially available data bases. Anyone with a computer or terminal willing to pay the subscription fee plus the hourly access rate can use these data bases. A typical subscription fee is roughly $15 to $20. CompuServe charges $22.50 per business hour and $5 per non-business hour. At this time modems are necessary to access these data bases.

> *"The advantage with electronic media is that it can be updated immediately."*

Let's assume you own a microcomputer and modem and wish to access one of these data bases—for example, CompuServe. You pay your fee and CompuServe sends you documentation, a password and phone number. The password verifies that you are a subscriber.

The literally hundreds of listings in CompuServe's subject index range from computer games to electronic newspapers. Want financial commentary? Type "Go RFC-1." You have a choice of whose movie reviews, editorials or horoscopes you want to read from sources such as *The Columbus Dispatch* and *The New York Times*. Public service information including tips on smoking and health, food preparation and personal finance are common items in the index.

But is access to these large data bases worth the expense to the home user? Why invest in the equipment just to access information that can be found in cheaper printed media?

The advantage with electronic media is that it can be updated immediately, so time-critical information (such as stock market quotes) can be accurate to within the hour. Few home users need such up-to-date information. Microcomputer owners may be more willing to spend a few hundred dollars to add videotext capabilities to their systems, and they undoubtedly make up the majority of the home-user videotext market.

Bulletin boards are small data bases set up by specific groups and can be accessed by anyone with the equipment. The only fee is the toll charge for the phone. Bulletin boards appeal to computer clubs because they are a convenient way to share information amongst club members, serving as a kind of newsletter.

Although there are hundreds of bulletin boards and the list is constantly growing, bulletin boards are not in the same class as commercial data bases. Many hobbyists have the equipment to access bulletin boards, though, and that equipment can also access the commercial data bases.

Videotext for the Masses?

There is a Catch-22 dilemma in the videotext industry: No one wants to take the financial risk of establishing a data base for a mass audience without that audience having the capability to access it, and no private individual will invest in videotext equipment without those data bases.

Radio Shack offers an inexpensive terminal called, appropriately, Videotex. At

Scanned by Ira Goldklang - www.trs-80.com

". . . for textual material Videotex is an attractive means of access."

this writing the unit, without color television monitor, costs about $400. Even with the cost of a modem this price is encouraging to the individual considering access to videotext data bases.

Videotex is not a versatile terminal: It is designed to access the large commercial data bases, bulletin boards and to be used in conjunction with Radio Shack's Videotex Network System. Its graphics capabilities are limited and it cannot access all data bases. But for textual material Videotex is an attractive means of access.

The Videotex Network System

Radio Shack offers the Videotex Network System to anyone wishing to set up a network. The system includes two Model II TRS-80 microcomputers, the Communications Multiplexer and any number of terminals. One Model II serves as a data base; the other stores and forwards information. The Communications Multiplexer permits handling of up to 16 phone calls simultaneously.

Again, nothing is earth-shattering about the technology, but the system's initial start-up price of under $20,000 makes it available to many groups that before could not afford to set up a network.

The Tiffin, Ohio, *Advertising-Tribune* has purchased one of these systems and plans to publish an electronic newspaper with it. Kaj Spencer, the paper's publisher, is satisfied with the system, though he said there are still problems to be solved. These include debugging the videotext software to make it compatible with the application. Spencer said he is working with Radio Shack's Senior Vice President for Special Markets Charles Philips to solve the problems. Both Spencer and Philips are optimistic that all bugs will be worked out; according to Spencer the system should be working by the time you read this, though they may have to abbreviate the data base.

Spencer is still unsure of the subscription price, but unlimited access should be in the range of $6 to $10 per month. He said 600 subscribers would make the system profitable, and is confident there are enough microcomputer and videotext terminal owners in the area to meet that figure.

The *Advertising-Tribune*, a member of the Buckner News Alliance, is not the only newspaper to publish electronic editions. Several newspapers, including *The New York Times* and *The Washington Post*, publish through CompuServe. The *Advertising Tribune*, however, is probably the first to establish a local electronic newspaper and is certainly the first using the Radio Shack system. (In an article published in the August, 1981 *80 Microcomputing*, Spencer suggested that other newspapers in his publishing group may start electronic editions if the *Advertising-Tribune's* experiment is successful.)

Radio Shack Starts its own Videotext Service

Radio Shack has announced plans to establish a videotext service of its own, using its Videotex Network System, in the Fort Worth, Texas, area. Philips said Radio Shack wants to prove the technology and marketability of its Videotex to the consumers.

Philips also said that Radio Shack has no intention of starting other videotext services, even if the Fort Worth experiment proves successful. "If it (the videotext service) is successful, we hope it will encourage other people to do it," Philips stated.

Radio Shack was still negotiating with several groups for data base services at this writing, although Philips would not elaborate on who they were. There is also the possibility that advertising will be solicited. Philips hopes the service will be available early this year.

Radio Shack's initiative in starting its own network reflects its confidence in the Videotex Network System. Jon Shirley, vice president of computer marketing, said Radio Shack does not expect to sell a large number of these systems, but they are pleased with the success so far.

Shirley said the Videotex Network System is "aimed at anyone who wants to set up a private data base system." The system's advertising is aimed at the institutions (such as education, publishing and agriculture) that probably would like their own network, but cannot afford a large investment in equipment.

Telidon

Canada has its own videotext system: Telidon, touted as the videotext of the future by some. Telidon's greatest asset is

Videotext Glossary

Acoustic Coupler: A device which receives audio signals through the receiver of your telephone and translates them into data signals the computer or terminal understands.

Antiope (Acquisition Numerique et Televisualisation d'Images Organisees en Pages d'Ecriture): A French videotext system; began operation in 1980.

Bulletin Board: Data bases (usually general or conversational) that can be set up and accessed by anyone with a microcomputer and a modem. A videotext terminal is not necessary to access a bulletin board.

CompuServe: A company located in Columbus, Ohio that offers a number of data bases for an hourly fee. Bases include news, sports, business, agriculture, personal finance, entertainment and weather. A modem and microcomputer or videotext terminal are required for access.

Data Base: An information source, stored in the host computer memory, accessed by a videotext terminal or microcomputer. A data base is the product bought when subscribing to a videotex service.

"Telidon . . . is currently too expensive for many potential users."

Dow Jones Electronic News Service: Dow Jones' data base, sold on a subscription basis.

Dumb Terminal: A terminal or terminal software that can only send and receive data with no ability for on-board computing.

Electronic Mail: Sending letters and other mail electronically from one terminal to another.

Fiber Optics: A transmission medium of glass fibers sending information via laser light. Fiber optics are much cheaper and more efficient than conventional means of transmission.

Grassroots: A Telidon-based agricultural network used by farmers in southern Manitoba. Grassroots is a spin-off of Project Ida.

iNet: A service allowing use of common carrier packet networks to videotext terminals. Developed by the Computer Communications Group of the Trans-Canada Telephone System, it will debut in Canada in 1982.

MicroNet: The hobbyists; time-sharing network of CompuServe.

Modem: A device mediating between the telephone line and your computer or terminal. It can make a direct electrical connection or be an acoustic coupler.

Multiplexer: A device or program allowing a host computer to handle a number of calls for data simultaneously.

Packet Network: An information system that sends data from terminal to terminal in "packets," or groups of bytes. Each terminal checks the data it receives to ensure it is not garbled.

PDI (Picture Description Instructions): Computer codes allowing the user to draw graphics on a CRT without picking out points on a mosaic grid.

Prestel: The British Post Office's videotext system.

Project Ida: An experimental Telidon-based videotext system using coaxial cables, television broadcast signals, fiber optic cables and satellites as transmission media. The experiment takes place across Canada.

Smart Terminal: A terminal or software capable of on-board computing as well as accessing data bases.

The Source: Another commercially available data base, owned by Readers Digest.

Telematique: A French videotext system.

Teletext: A one-way system that uses the VBI of your television to transmit data.

Telidon: The Canadian videotext, run by Bell Canada. Telidon is capable of using several transmission media, but its terminals are too expensive at present for most home users.

Tymnet: A commercial data base currently using phone lines for transmission, but they have announced plans to use microwaves or satellites.

VBI (Vertical Blanking Interval): The unused portion of the television broadcast signal commonly used for videotext transmissions.

Videotext: Generic term for interactive electronic communications using computers or videotext terminals.

its outstanding graphics capabilities, but it is currently too expensive for many potential users.

Telidon, sponsored by the Canadian government, is run by Bell Canada. It was developed at the Communications Research Centre in Ottawa and introduced in 1978. The Telidon system consists of a data base in a central computer, a modified television set with a decoder and keyboard, and a means of data transmission.

Telidon differs from videotext hardware such as Radio Shack's in that it does not use a full keyboard, and therefore cannot access data bases such as CompuServe without modification. It can use several types of data transmission media (fiber optics, phone lines, coaxial cables and satellites).

(For further information on Telidon-related projects, please refer to "The Terminal Connection" printed elsewhere in this issue.)

Telidon Versus Radio Shack

At this point, Radio Shack has virtually no competition in its price range for videotext terminals and network systems. This may change, though.

Three companies manufacture Telidon hardware in Canada. The Hemton Corporation in Ottawa, Ontario, makes electronic projectors and information provider terminals. Norpak Limited in Pakenham, Ontario, also manufactures information provider terminals as well as terminal modules. Electrohome Electronics in Kitchener, Ontario, manufacturers the color video monitors.

Radio Shack sells its Videotex terminal for $399; the current price for a Telidon terminal is about $1,000. The cost of setting up a network using Telidon equipment is three to four times more than using Radio Shack equipment, according to Philips.

Telidon spokespersons say that with increased orders and production the price of a Telidon terminal will plummet. Within the last year the price has dropped several hundred dollars. Andrej Tenne-Sens, a technical adviser for Telidon at Canada's Department of Communications, said that when decoder production reaches 100,000 the price could fall to about $150. This price, however, does not include a color monitor, modem or full keyboard.

That $150 price tag will also reflect a change in the method of production, Tenne-Sens noted. Very large scale integration (VLSI), a process placing more circuits on a single chip, will reduce production costs as well as the size of the decoder, and will in-

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CP-203C

"By 1984 or 1985 Norpak hopes to market an interactive communication system that is consumer oriented."

crease the efficiency of the unit.

Radio Shack officials doubt Telidon production will get that high and price drop so low. "(The drop in price) is really an illusion," Shirley said. "Mass production does not mean a drop in price." Shirley cited inflation and labor costs as reasons cost will not drop dramatically. He predicted the cheapest terminals will be made where labor costs are lowest, such as in Asia.

Philips doubts 50,000 to 100,000 Telidon terminals can be sold within the next few years. But Telidon terminals have sold in number to the government of Ontario (2,000), the *Times/Mirror* Corporation of Los Angeles and *The Washington Post*. Gordon Thorgeirson, vice president of marketing at Norpak, would not give an exact figure of how many terminals have been sold, but he did say Norpak is satisfied with the response Telidon systems have received.

Thorgeirson is optimistic about the future of Telidon. Telidon uses alpha-geometric graphics rather than the alpha-mosaic other systems use. Thorgeirson said Norpak has signed an agreement with Siemens, a West German company, to develop a system combining the alpha-mosaic graphics of European videotext systems with the convenience of Telidon. This suggests Telidon may find a healthy market in Europe.

By 1984 or 1985 Norpak hopes to market an interactive communication system that is consumer oriented, Thorgeirson said. Telidon systems are designed with business in mind because that is where the market is now. This interactive system will access the commercial data bases the Radio Shack Videotex accesses.

The Apple Connection

Norpak is manufacturing an interface card for the Apple II microcomputer that will make it compatible with Telidon systems. The Apple Interface Card plugs into the expansion slot, making the Apple II a full information provider system.

David Killins, national sales manager for Apple Canada, said Apple will market the card worldwide in the first quarter of 1982. The projected price of the card is $500. Since the card has an RS-232 connector as well, its purchasers will be able to access Telidon data bases, as well as CompuServe, The Source and other similarly based data bases.

"The videotext world is not going to materialize overnight," Killins said, "but we know from one-half million Apple owners a percentage will see Telidon as an added functionability." He expects some Apple computers to be sold because of the card, but marketing will be geared toward existing Apple owners.■

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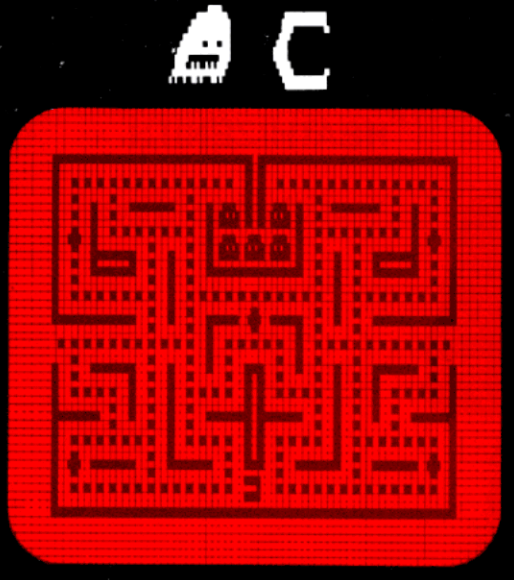

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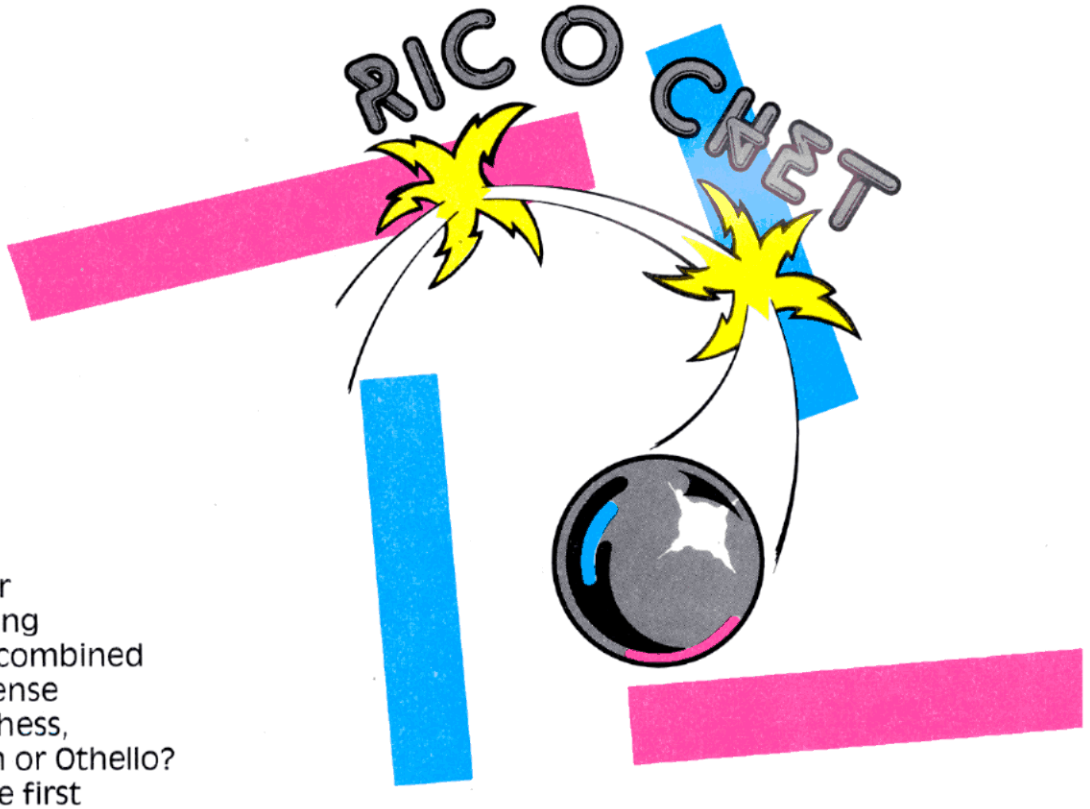

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Telidon networks its way into the heart of Canada.

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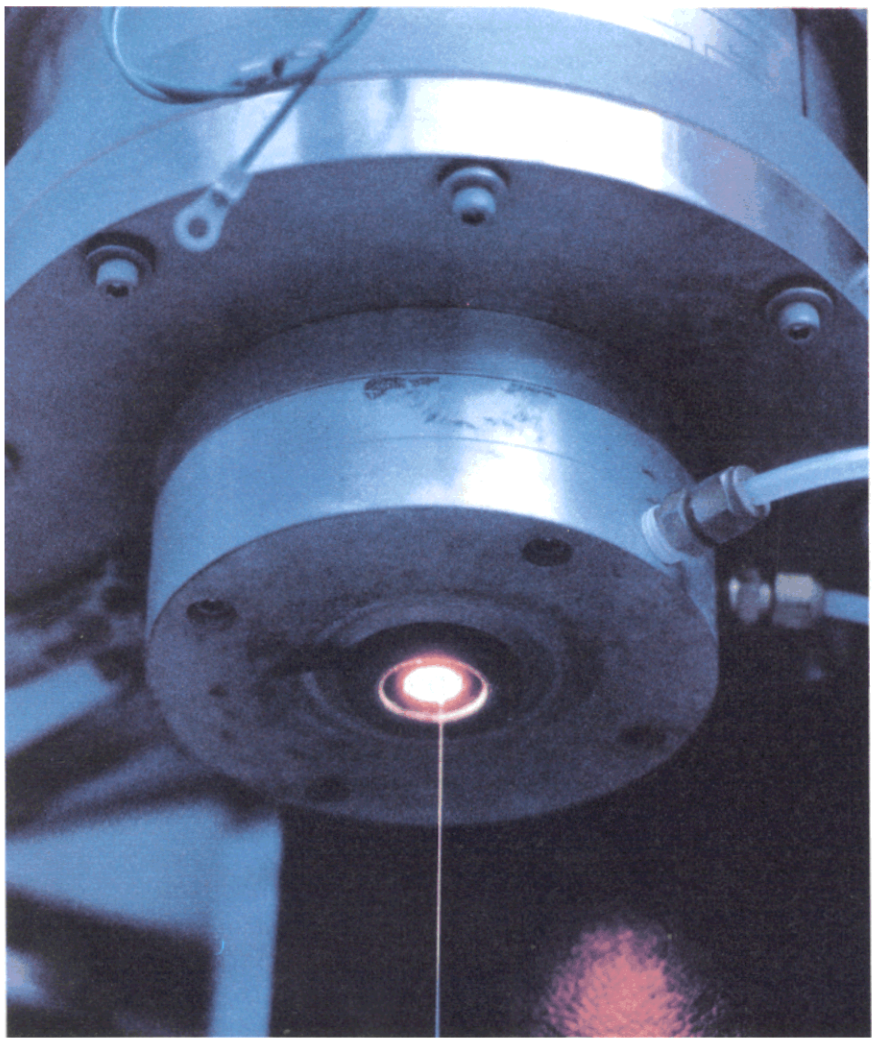

Photo 1. A glass tube is transformed into an optical fibre. A tube of glass is drawn through a machine, stretching it to the thinness of a human hair.

by Bert Latamore
Desktop Computing *staff*

This could be a big year for videotext systems. American Telephone and Telegraph (AT&T) has adopted a videotext standard based on Canada's Telidon system and announced plans to test it in a joint experiment with CBS in New Jersey. The British are actively promoting their Prestel videotext system, which they claim is very inexpensive. The Germans are reportedly developing a videotext system of their own. The new French government ambitiously plans to wire the entire country with their own videotext system, Telematique.

It might seem strange to include a rural telephone system in this list of government and industry giants, but the first experiment in large scale videotext use in the home was designed and is being conducted by the Manitoba Telephone System (MTS) of Winnipeg. For a year this Canadian prairie-province utility has conducted experiments with Canada's Telidon using two databases—one for urban Winnipeg and the other for farming communities; and three transmission media—normal telephone wires, coaxial cable such as that used to carry cable television signals, and fiber optics, the newest medium for information transmission. All have proven popular and technically feasible.

Officials at the Trans-Canada Telephone Co., Manitoba Telephone's parent company, found the urban cable transmission experiment too expensive to expand as originally planned. The farm project, however, has moved beyond the experimental stage and is now a regular service throughout the province. It is quite possibly the first generally available videotext service to run on a commercial basis.

Project Ida

Named after Ida Cates, Manitoba's first female telephone operator, Project Ida is an experiment in high-quality videotext service. The system is connected to about 100 urban homes in the Winnipeg suburb of South Headlingley via a modified cable television network. About 20 private firms ranging from a daily newspaper to a fire alarm company supply services over the system. Ida offers fire, police and medical alarms, automatic meter reading and cable tv as well as the videotext information service.

The database includes stock quotes, computer games, stereo music, educational exercises, current events and entertainment schedules. The system is interactive; the user may choose a subject, answer test questions or otherwise communicate with the system using a hand-held numerical key-pad.

Ida is popular with its test audience and has presented surprisingly few technical problems, according to Carolyn Rickey of MTS. MTS originally planned to expand Ida by upgrading the present cable television network system in Winnipeg to allow two-way passage of information. The upgrade

"While Ida is a home-entertainment service, Grassroots is aimed solely at farmers."

would involve replacing the presently used one-way signal amplifiers that boost signals throughout the cable system with two-way amplifiers. When finished, Ida would be available to most of the 600,000 residents of the city and its suburbs.

MTS was enthusiastic about the plan and intended to begin the upgrading process next summer. Cost of the work, however, was estimated at between $16 and $30 million, and Trans-Canada Telephone, MTS' parent firm, decided it was too much to spend. They vetoed the Ida expansion plans.

The Ida experiment, therefore, will remain just that. The present experiment will continue through the spring, according to Rickey. After that, MTS will keep the hardware system, which reaches about 150 previously uncabled homes, intact for future two-way transmission experiments. Meanwhile, cable television companies will use it to provide normal cable services.

Grassroots

Ida is not the only iron in the MTS fire. MTS has also developed a rural videotext service called Grassroots.

The only similarity between the two systems is that both use Telidon equipment. Grassroots is a stripped-down database offering no auxiliary services. While Ida is a home-entertainment service, Grassroots is aimed solely at farmers. Its services include weather predictions, commodities market quotes and graphs showing market trends from the Winnipeg Farmers' Exchange, information from the Manitoba Department of Agriculture and weekly grain and livestock reports.

Grassroots operates over existing narrow-band telephone wires, avoiding the

Raising Telidon's IQ

Even as services like Grassroots begin to put videotext terminals into large numbers of homes, another branch of Trans-Canada Telephone is opening the door of international telecommunications to Telidon and its cousins.

Computers have been talking long distance to each other for many years via the international packet network system. The packet networks are common carriers designed specifically to handle digital data transmission. They have redundancy features in their design to ensure against message garbling and to create maximum use of transmission lines. The packets also handle nearly all interfacing problems between different kinds of computers.

Designed originally to serve users of time-sharing equipment, they soon created a new information industry, the public data base. Several thousand of these are available in 35 counties, available to their subscribers for the cost of a local telephone call and the time rental charge of that particular data base.

With the advent of the home computer, the packet networks have begun to bring their services home. Some older services, like Lockheed's Dialog and the Dow Jones Electronic News Service, have begun the move to the home market. Others have continued their own specialities, but are available for the professional to use at home as well as in the office. And others, notably The Source and CompuServe, have been created specifically to serve the home market.

Unfortunately, a full keyboard is needed to use the networks and their data bases. Complex alphanumeric codes must be entered to identify the data base you want to the network and to identify yourself to the data base for billing and security purposes. They have therefore been closed to videotext terminals with hand-held calculator-type keyboards.

Datapak Canada, the packet network division of the Trans-Canada Telephone Co., may be on the verge of changing that. Datapak is scheduled to start a year-long test of a new service called Inet (intelligent network). Although the test is aimed at businesses, it could have a great effect on home videotext development, because it will allow Telidon and its cousins to access and use many packet-network data bases.

Inet does two new things. It gives the user a complete menu of all databases available, and it acts as an active interface between the user and the data base. By combining these capabilities it creates several services.

The Inet user, for the first time, has a totally up-to-date list of all packet data bases available on the service. If Inet-type services become common, eventually a list of all operating data bases would be available. The only lists currently available are printed, and because of the high growth rate of the packet system and its clients, these are inevitably outdated by the time they come off the presses.

The Inet user has to identify himself only once to the system. Each subscriber to each data base has a personal identification code he must give the data base before he can use it. Anyone using many data bases has to keep track of each number and use the correct one with each data base. Furthermore, to leave one data base and go to another, the user must hang up and redial the local connection to the packet system each time he wants to switch, a time-consuming and annoying process.

The Inet user, on the other hand, merely accesses Inet and gives it his identification. He then picks a data base from the menu and Inet identifies the user to the data base. When he wants to switch to another data base, he issues a simple command to return to Inet.

The user also receives a unified billing for all data base uses. Datapak spokesman Brian Frazer said they had not yet worked out details as to whether this would mean a subscriber to Inet would automatically have a subscription to all the data bases involved in Inet. This would eliminate the problem of having to arrange a subscription with each new data base you want to try out, and would allow you to access a data base you normally would not use when a special need arose.

It is doubtful large numbers of consumers with no present connection to computers will hear of Inet and buy a videotext terminal solely because of it. But if videotext services become commonplace, Inet could have a huge impact on those who already own such systems. ■

"Fiber optic transmission lines are broad-band carriers transmitting light instead of electricity."

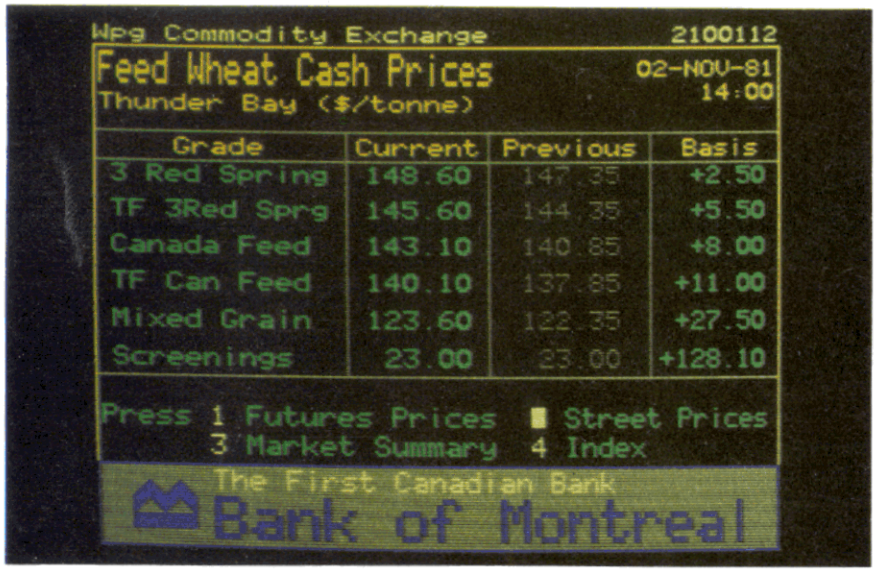

Photo 2. Page from Grassroots (Photo Courtesy Infomart).

need for expensive special cable systems. The marketing strategy MTS uses for Grassroots also is different. While all Ida terminals are in private homes, many of the 50 Grassroots test installations are in agricultural department field offices, grain elevators and credit union offices where they are available free to many farmers.

This fall, Grassroots moved beyond the experimental stage. The Canadian authorities approved a regular rate schedule, making Grassroots, including rental of Telidon terminals and access to the data base, available province-wide.

The service is not cheap. Rental of one Telidon unit costs $47.50 a month with a two-year lease, plus a $75 installation charge. Access to the data base, including line-use charges, cost five cents a minute regardless of the customer's location. Placing Grassroots in public locations puts MTS in the interesting position of competing against itself for new subscriptions. Despite this, Grassroots gained 42 new subscribers in its first three weeks. And, according to Rickey, they have received queries from two US farm groups.

Fiber Optics

Grassroots has been involved in a concurrent experiment in fiber optics. Fiber optic transmission lines are broad-band carriers, transmitting light instead of electricity. Single glass fibers about the thickness of a human hair can carry many information channels very quickly. They do not shatter and are surprisingly flexible. They promise considerable cost savings over copper lines.

Fiber optics has been used primarily for long-distance transmissions and is still an experimental medium. MTS, by its own admission, is the first company to try a fiber optic rural distribution system. One-hundred-fifty farms, homes and businesses in the towns of Elie and St. Eustache have been connected by about 70 km of glass fiber for an 18-month to two-year test cosponsored by the Federal Department of Communications, the Canadian Telecommunications Carriers Association and MTS. The fiber system carries digital telephone, cable television, FM radio and Grassroots. The fiber optics field trial was purposely located in the same towns as the Grassroots experiment to include Telidon transmissions.

It is too early to anticipate the results of the test. If fiber optics proves itself, however, it may have a significant effect on videotext systems. For instance, it could allow Grassroots to expand to include some or all of the Ida services.

Although MTS organized and partially funded the three experiments, it avoids going beyond the role of common carrier for electronic information, according to an MTS spokesman. MTS does not run the Ida and Grassroots data bases, nor does MTS control their content. The data bases are provided by an unconnected Winnipeg-based company, Infomart. Infomart may offer some or all of the Ida services over an interactive fiber optic transmission system like the one in this experiment. In fact, the news release issued by MTS announcing the experiment promised general and educational programs would be added to the Telidon database offered over the fiber optic system.

The Author Speaks

If the MTS fiber optics experiment is successful, the telephone and cable television industries may have strong economic reasons to combine efforts to replace the present copper wire telephone networks with fiber. This will take time, of course, but it will open the way for readily-available videotext services.

Some cable companies are already involved in their own videotext experiments. If the Grassroots and other, overseas experiments in videotext demonstrate the existence of a market for this home service, videotext terminals may become as common as television sets by the year 2001. Indeed, videotext capabilities may be built into many television sets.

Predictions are always dangerous. The future is shaped by many contradictory forces. At the moment, however, one of those forces seems to be building up in Canada. It is not beyond the realm of possibility that a major component of our future is being developed today in Manitoba's Red River Valley.■

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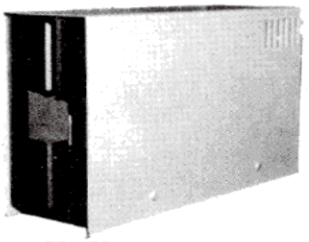

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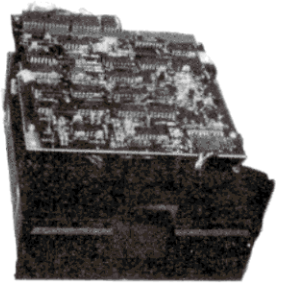

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The TRS-80 Color Computer and CompuServe.

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CompuServe is an information service available through Radio Shack. A software package converting your TRS-80 Color Computer to a terminal is available for $29.95. It includes the TRS-80 Videotex Software, one free hour of access time on CompuServe, an operator's manual, and an identification number and password.

Connection

To go on-line with CompuServe, you require a modem or acoustic coupler connected to the RS-232 connector on the back of your Color Computer.

Load the software using the CLOADM command, and enter EXEC. Press the Break key, and the program will display Place Call. Dial the local phone number given by your Radio Shack dealer to access the service. Place your telephone receiver into the cradle of your acoustic coupler (if you are using one), then press Break. CompuServe will request your identification number and secret password. If both numbers are entered correctly, you will be logged-on to the service.

New subscribers are requested to enter their name and address to establish an account. When this is completed, CompuServe displays the following:

```
CompuServe Information Service

1 Newspapers
2 Finance
3 Entertainment
4 Communications
5 CompuServe User Information
6 Special Services
7 Home Information
8 Education
9 Micronet Personal Computing
Enter your selection number, or H for more information.
```

Current CompuServe user rates are $5 per hour connect time between 6 p.m. and 5 a.m. Monday through Friday, all day Saturday, Sunday, and during any legal holiday. During prime time the cost is $22.50 per hour. The fee includes 128K bytes of free disk storage when using the Micronet computing service.

Micronet Personal Computing

Enter a 9 from the preceding menu to access Micronet. The following menu will be displayed.

```
Personal Computing Area

1 Special Interest Groups
2 Software Exchange (Softex)
3 Manufacturers' Newsletters
4 Line Printer Art Gallery
5 Index
6 Command Mode
Last menu page. Key digit or M for previous menu.
```

Enter 6 to access Micronet for personal computing. A users manual is required for using Micronet. You may order it through Feedback for $5. They will charge it to your account and mail you the manual.

MicroQuote

MicroQuote, a stock market information service, is a recent addition to CompuServe. It allows the stock investor to get data on more than 32,000 stocks. MicroQuote is updated daily; historical prices, volumes, and dividends are available back to December 31, 1973. It costs you $1 each time you access MicroQuote. You are charged $.05, $.10, $.15, for each daily, weekly, or monthly data set, respectively. The data set includes the date, volume, high/ask, low/bid, and closing price of the stock.

Several other programs run within MicroQuote. MQDATA transfers data to your microcomputer (using another program called FILTRN), so you can analyze the data off-line.

MicroQuote is accessed through the Finance section of CompuServe. When in the CompuServe Information Service menu, page CIS-1, enter a 2 for Finance.

Newspapers

CompuServe news service is accessed through the main menu at page CIS-1 by entering 1. The following menu will be displayed:

```
1 The Columbus Dispatch
2 The New York Times
3 Virginian-Pilot & Ledger-Star
4 The Washington Post
5 The San Francisco Chronicle
6 The San Francisco Examiner
7 The Los Angeles Times
8 Minneapolis Star and Tribune
Last menu page. Key digit or M for previous menu.
```

There are many papers to choose from; you also have access to the AP News Wire Service. The AP is accessed through the Columbus Dispatch. When you enter 1 for the Columbus Dispatch:

```
The Columbus Dispatch

1 Top News Briefs
2 US/World News
3 Local/Ohio News
4 Political Campaigns
5 Sports
6 Business
7 Opinion/Editorial
8 Leisure/Entertainment
Last menu page. Key digit or M for previous menu.
```

Enter 2 for US/World News to access AP News. The following menu is displayed:

```
The Columbus Dispatch

1 World News
2 US News
3 Washington News
4 AP World News
5 AP US News
6 AP Washington News
Last page menu. Key digit or M for previous menu.
```

Access the AP by entering either a 4, 5 or 6. If you are interested in reading any of the latest stories from the AP World News, Enter 4. Here is the partial menu of stories offered on 08/02/81, after I entered 4:

```
The Associated Press

2 Iran Israel
3 Wedding Airport
4 Charles Australia
5 Gambia Coup
6 Irish
7 Iran Iraq
8 Foreign Briefs
9 Israel
0 Boat People
Input a number or key <Enter> for more choices.
```

I am not sure CompuServe is useful for news access. Accessing news is time consuming when you can read the same information in your local newspaper for about 20 cents. The news is not up-to-the-minute; you cannot key-word search the news for desired subjects of interest (a useful feature for newscasters or freelance writers).

Electronic Mail

This allows you to send a message (electronic letter) to another subscriber. You must know the receiver's ID number. When the person is logged-on to CompuServe the system announces that a message is waiting. At present, with only 10,000 subscribers, this service is not an alternative to the U.S. mail system.

Saving Access Time

To disconnect, Enter Bye or Off; the system displays the time you logged off and the amount of time (in minutes) you used.

Now use a page storage feature of the software for the Color Computer. Scroll through the last pages of your session with CompuServe (saved in your computer's memory) with the up and down arrow keys. To save connect time, disconnect when you have filled your computer's page capacity storage limit (about 16 pages in a 16K Color Computer). Review the material before logging back on to the service.

Speed your access of the service with the following CompuServe commands:

```
T—Top Menu Page
M—Previous Menu
F—Forward a Page
B—Back a Page
H—Help
R—Resend Page
S N—Scroll from Item "N"
G N—Go Directly to Page "N"
N—Display Next Menu Item
P—Display Previous Menu Item
```

For example, you may go directly to the newspapers. Type H if you need help.■

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TRS-80 owners can use the CompuServe/Micronet network with Radio Shack's Videotex software package. The package includes a cassette tape of the terminal software, a software manual, a hardware manual, and your sign-on I.D. number and password.

When you first sign on, the system asks how you would like to pay the $5.00 per hour rate. Long-distance tolls are additional. An arrangement between Radio Shack and CompuServe gives one free hour of connect time to anyone using Videotex software.

You will receive the Micronet user's guide two weeks after setting up billing procedures; read it carefully.

If your city is without a system network use a Tymnet to connect with the network for an added $2.00 per hour.

Once you know the system your phone calls become shorter. The system allows you to recover your early mistakes.

A feedback service allows users to question the Micronet staff. The next time you sign on you will be notified to pick up your waiting message. Enter the communication option before logging into Micronet.

If the system gives you any problems notify Micronet on the feedback service or call the free 800 service. A bulletin board service sends your messages to other users.

For the Executive

Micronet offers an Executive package allowing up or downloading software to or from the system. To receive the Micronet Executive, run a program which prints out a Basic program to key into your own system. Call the system, log into Micronet and Enter R GETEXE. The system gets the Executive software and asks questions about your system (cassette or disk based and amount of memory). Executive then downloads into your computer. You are given the addresses needed to copy the program on tape or disk.

For instructions to download Executive key in:

```
TYP SYS:MNEXEC.DOC
```

Downloading the Executive takes time and phone calls. You are not charged for downloading the Executive; take your time.

Micronet Offerings

The Micronet system offers a variety of downloaded software for a fee.

The system offers each user 128K of disk space for storage (at $0.30 per 1K). You must access the system once a month or they clear your disk space.

Log into Micronet and call me through the national bulletin board (I.D. number 70575,300).■

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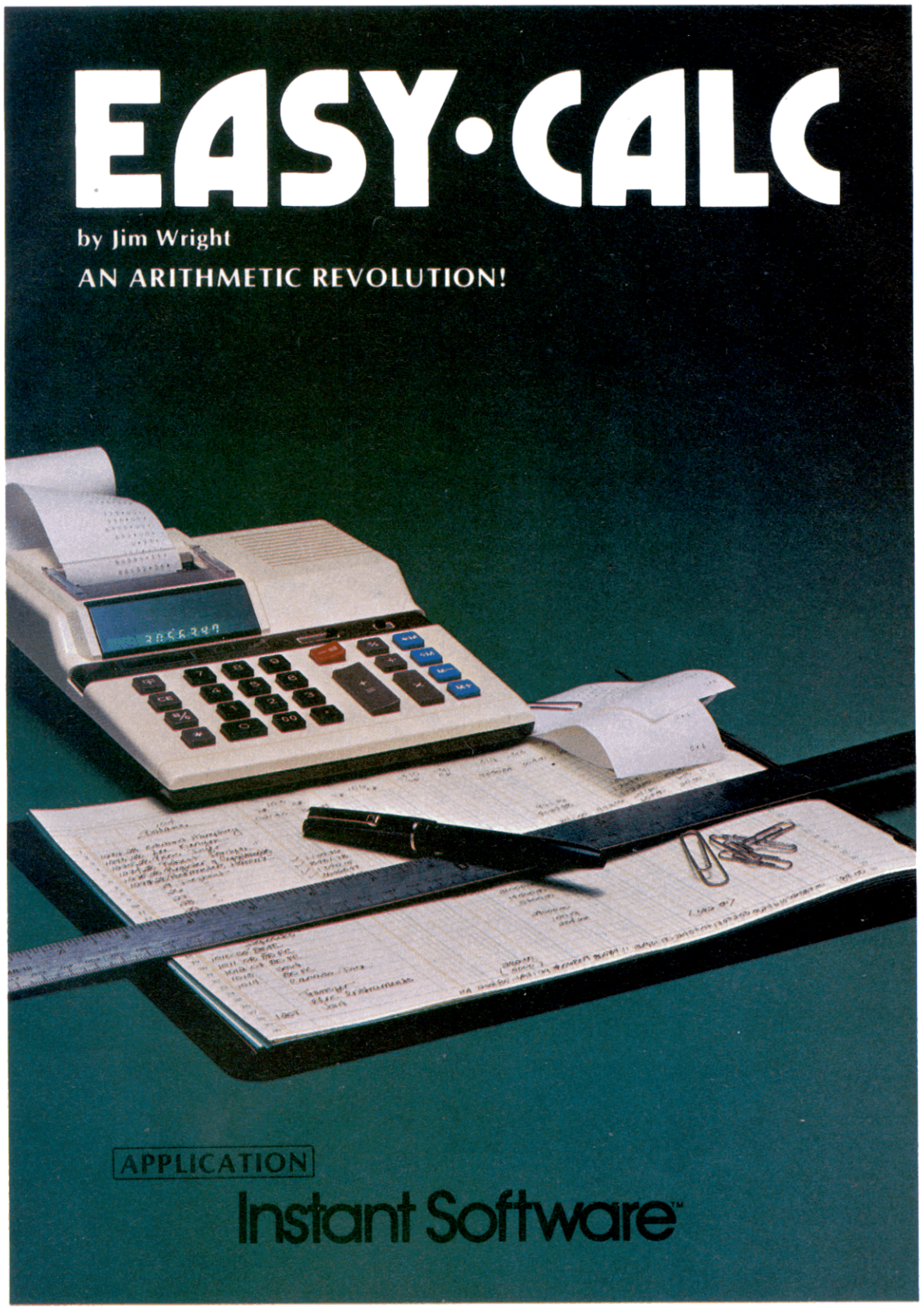

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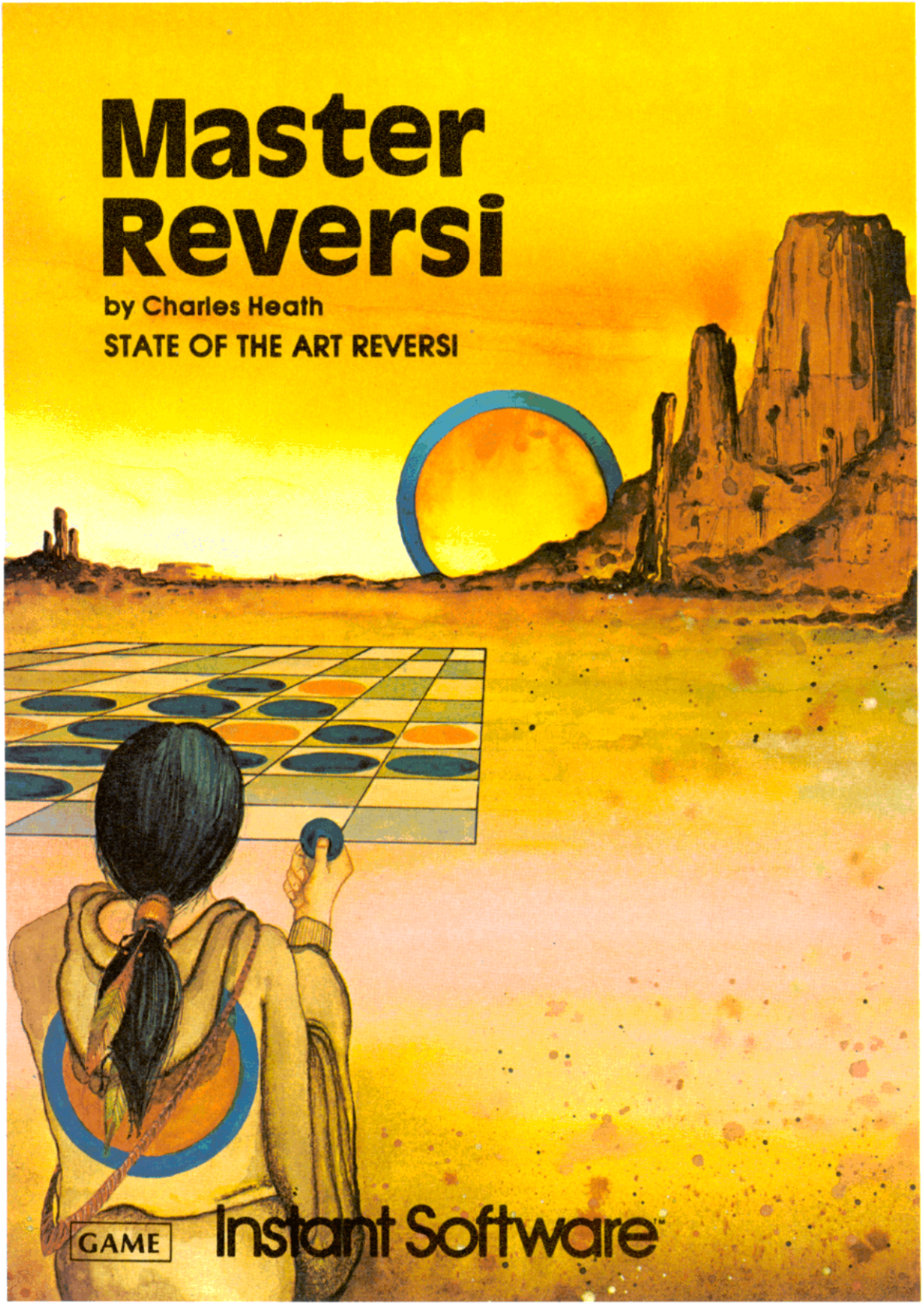

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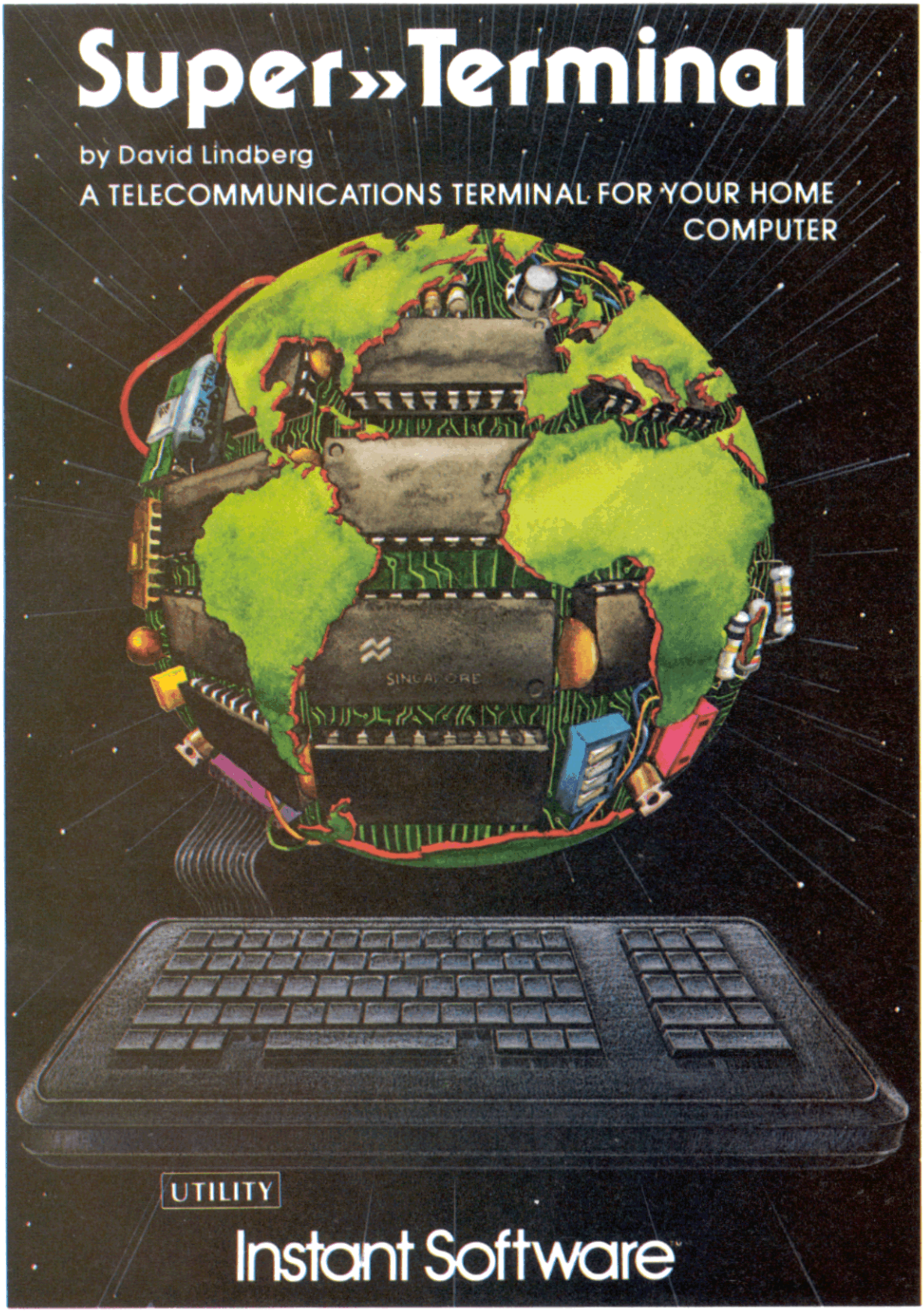

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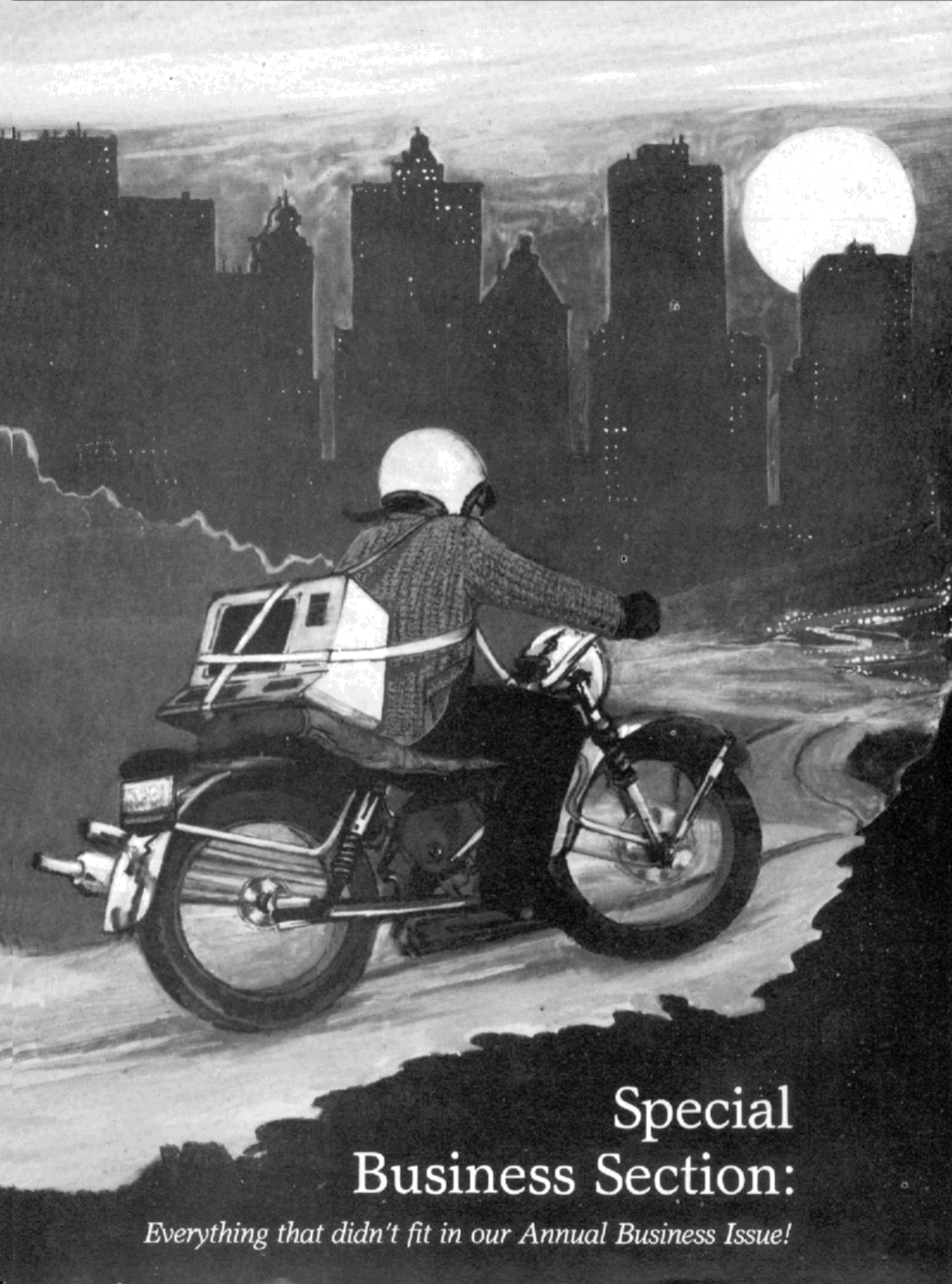

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Now is the time for Tiny Pascal to come to the aid of all good programmers.

Learning A Little Pascal, Part II

Margaret M. Grothman
5117 Denton Place
Madison, WI 53711

This is the second article in a series on Radio Shack's Tiny Pascal. This article begins with three short programs to review the last lesson. Since review by itself, like a meal of leftovers, is unsatisfying, each program contains new ideas explored later.

Review Program 1: Multiple-Choice

Enter and run Program Listing 1. It is like the menu selection program in part one, but with some new wrinkles.

Remember that instruction 13 within a Write statement produces a line feed and carriage return. Line four clears the screen and returns the cursor to the upper left corner. Many other screen control commands can be executed in the same way.

The Case statement is ideal for a multiple choice test. Different messages can be designed for each response. One Case statement appears nested inside the other in this program, valuable when you want to follow wrong answers with another question. (The importance of correctly indenting program lines becomes evident in this program.)

Notice four End statements. The last End (followed by a period) is the program End statement, and is aligned with the program Begin statement. Two of the other three Ends are delimiters for the Case statements, and the other (with the semicolon) marks the end of a set of multiple statements for a case branch. Construct a program from the outside in (more often referred to as top-down) to avoid confusion.

```
VAR OPTION:INTEGER;
BEGIN
  WRITE(28,31);
  WRITE('WHICH OF THE FOLLOWING IS AN INTEGER?',13);
  WRITE(' 1. 1.9',13);
  WRITE(' 2. 2',13);
  WRITE(' 3. 1/2',13);
  WRITE(' 4. NONE OF THE ABOVE IS AN INTEGER.',13);
  READ(OPTION#);
  CASE OPTION OF
    1,3,4:BEGIN
      WRITE(13,'NO! AN INTEGER IS A WHOLE NUMBER. TRY ANOTHER.',13);
      WRITE(' 1. 1290',13);
      WRITE(' 2. .07',13);
      WRITE(' 3. ONE-THIRD',13);
      WRITE(' 4. ALL OF THE ABOVE ARE INTEGERS.',13);
      READ(OPTION#);
      CASE OPTION OF
        1:WRITE('RIGHT! GO ON TO THE NEXT QUESTION.');
        2,3,4:WRITE('GO BACK TO THE BOOK AND STUDY INTEGERS!')
      END
    ENDS;
    2:WRITE('CORRECT! GO ON TO THE NEXT QUESTION.',13)
  END
END.
```

Program Listing 1. Multiple Choice Test.

```
  CASE OPTION OF
    1,3,4:BEGIN
      WRITE(13,'NO! AN INTEGER IS A WHOLE NUMBER. TRY ANOTHER.',13);
      WRITE(' 1. 1290',13);
      WRITE(' 2. .07',13);
      WRITE(' 3. ONE-THIRD',13);
      WRITE(' 4. ALL OF THE ABOVE ARE INTEGERS.',13);
      READ(OPTION#);
      CASE OPTION OF
        1:WRITE('RIGHT! GO ON TO THE NEXT QUESTION.');
        2,3,4:WRITE('GO BACK TO THE BOOK AND STUDY INTEGERS!')
      END
    END;
    2:WRITE('CORRECT! GO ON TO THE NEXT QUESTION.',13)
  END
END.
```

Program Listing 2

```
VAR NUMBER,DVSR,PRIME:INTEGER;
BEGIN
  WRITE(28,31,'ENTER A POSITIVE NUMBER BETWEEN 1 and 32767');
  READ(NUMBER#);
  DVSR:=1;
  REPEAT
    DVSR:=DVSR+1;
    IF NUMBER MOD DVSR=0 THEN
      PRIME:=0
    ELSE PRIME:=1;
  UNTIL (NUMBER DIV DVSR<=DVSR) OR (PRIME=0);
  IF (NUMBER=2) OR (PRIME=1) THEN
    WRITE(13,'THIS IS A PRIME NUMBER')
  ELSE
    WRITE(13,'THIS IS NOT A PRIME NUMBER')
END.
```

Program Listing 3. Prime Numbers.

Scanned by Ira Goldklang - www.trs-80.com

Begin with the outside skeleton, and gradually fill in the details. Draw lines or brackets to indicate related statements. The bottom portion of Multiple-Choice is shown in Program Listing 2 with lines drawn. The largest and smallest brackets define the two Case statements. The second line from the outside connects the two branches of the large Case statements. The other line defines the multiple statements within a case branch.

Without these lines it is easy to make errors indenting or placing the End statements. They are especially valuable when you come back to a program after an interruption, because they make the structure clear immediately.

The case variable name Option is used in both statements; once it points to the correct branch in the first statement, it can be used in later Cases, even nested ones.

Review Program 2: Prime Numbers

Before talking about the syntax of Program Listing 3, let's look at what it does. The user enters a positive integer. The program divides that integer by two, then three, then four until a division leaves no remainder (NUMBER MOD DVSR = 0). If there is no remainder the number is not prime, and the variable Prime is assigned a value of zero. No more divisions will take place. A single even division proves that the number is not prime. When the quotient is less than or equal to the divisor no further possibility of an even division exists.

If all of the divisions result in remainders, the variable Prime equals one when the Repeat loop is completed. The first Write statement will be executed, printing the message that the number is prime. Two is a prime number although it is evenly divisible; it requires special consideration in the If statement.

The program reviews the If... Then... Else statement and the Repeat...Until statement. Repeat...Until construction allows multiple statements without the use of Begin and End. The second statement in the loop is an If...Then...Else statement. Although it appears on three lines, it is only a single statement and contains no semicolons.

Arranging a statement like this is a matter of personal taste. It can be put on two lines or one. If more than one instruction is needed following Then or Else, boundaries for the statements must be used (Begin and End). The last If...Then...Else statement is also written on multiple lines. This one does not need a semicolon at the end, because it is the last program statement.

The second If...Then...Else statement contains a two term Boolean expression. Recall the meaning of the logical Or; if

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"Does a Pascal programmer have to memorize all these confusing syntax rules?"

either of these terms is true, the entire expression is true.

Although you have used these statement types before, they are combined in new ways. An If...Then...Else statement is nested within a Repeat...Until loop, another If...Then...Else statement is written over several lines with no punctuation, and the expression following Until is complex, containing a math operator (DIV), a relational operator (< =), and a logical operator (OR).

Does a Pascal programmer have to memorize all these confusing syntax rules? Fortunately not. The syntax of Tiny Pascal is described explicitly and concisely in syntax diagrams. You may have already puzzled over the diagrams in the Tiny Pascal Manual (Appendix C, pages 23 through 26). After this lengthy introduction you will get a scenic tour of syntax diagrams.

Review Program 3: Clock

This last of the review programs will not replace your quartz crystal watch for accuracy, but it does a nice job of illustrating nested Repeat statements (See Program Listing 4.).

Before studying this program, draw lines to connect the Repeats and the Untils to avoid getting entangled in the multiple nests.

The real work of the clock takes place in the center, in the For...Do loop. After the Write statement is executed 73 times, the value of Second is incremented by one.

```
VAR TIME,HOUR,MINUTE,SECOND:INTEGER;
BEGIN
  WRITE(28,31,'WHAT IS THE STARTING HOUR',13);
  READ(HOUR#);
  WRITE(13,'WHAT IS THE STARTING MINUTE',13);
  READ(MINUTE#);
  WRITE(13,'WHAT IS THE STARTING SECOND',13);
  READ(SECOND#);
  WRITE(28,31);
  REPEAT
    REPEAT
      REPEAT
        REPEAT
          FOR TIME: = 1 TO 73 DO
            WRITE(HOUR#,':',MINUTE#,':',SECOND#'  ',15,28);
          SECOND: = SECOND + 1
        UNTIL SECOND = 60;
        MINUTE: = MINUTE + 1;
        SECOND: = 0;
      UNTIL MINUTE = 60;
      HOUR: = HOUR + 1;
      MINUTE: = 0;
    UNTIL HOUR = 13;
    HOUR: = 1
  UNTIL TIME<>TIME
END.
```

Program Listing 4. Clock

```
VAR N:INTEGER;
BEGIN
  FORN: = 192 to 205 DO WRITE(N,'TAB',(N-191)#,13)
END.
```

Program Listing 5. Tab

```
VAR LINE,LOOP:INTEGER;
BEGIN
  WRITE(28,31);
  FOR LINE: = 1 TO 8 DO WRITE(13);
  WRITE(218,15,23,'HELLO');
  FOR LOOP: = 1 TO 30000 DO LOOP: = LOOP + 1;
  WRITE(28,31)
END.
```

Program Listing 6. Hello

```
VAR CHAR:INTEGER;
BEGIN
  WRITE(28,31);
  REPEAT
    READ(CHAR);
    WRITE(8,CHAR);
  UNTIL CHAR = 31;
  WRITE(8)
END.
```

Program Listing 7. Typing Practice

```
BEGIN
  WRITE(28,31,13,13);
  WRITE(222,'↑',13);
  WRITE(220,'NORTH',13,13);
  WRITE(218,188,188,188,188,188,190,188,176,176,13);
  WRITE(218,143,191,143,143,143,191,143,141,174,159,13,13);
  WRITE(220,'SOUTH',13);
  WRITE(222,92,13,13,13,13);
  WRITE(196,'USE THE ↑ AND ',92,' KEYS TO INDICATE THE TRUCK',39,'S DIRECTION.')
END.
```

Program Listing 8. Truck

```
VAR N,SUM,HIGH,LOW,COUNT:INTEGER;
  SCORE:ARRAY(25)OF INTEGER;
BEGIN
  WRITE(28,31);
  WRITE('HOW MANY SCORES ARE THERE',13);
  READ(N#);
  SUM: = 0;LOW: = 100;HIGH: = 0;
  FOR COUNT: = 1 TO N DO
    BEGIN
      WRITE('ENTER A SCORE');
      READ(SCORE(COUNT)#);
      SUM: = SUM + SCORE(COUNT);
      IF SCORE(COUNT)<LOW THEN LOW: = SCORE(COUNT);
      IF SCORE(COUNT)>HIGH THEN HIGH: = SCORE(COUNT);
    END;
  WRITE(N#,' SCORES WERE ENTERED.',13);
  WRITE('THEY RANGE FROM',LOW#,' TO ',HIGH#,'.',13);
  WRITE('THE MEAN IS ',(SUM DIV N)#,'.')
END.
```

Program Listing 9. Test Scores

Why 73? That is the number of times the Write statement can be executed in one second. A shorter or longer Write statement requires a different number for correct timing. When the value of Second reaches 60, Minute is incremented by one and Second is reset to zero. Similarly, when the value of Minute reaches 60, Hour is increased, and Minute and Second are reset to zero. At the stroke of one all variables are reset to zero to begin the cycle again.

What is that last Until statement? Until Time does not equal Time? You want the clock to run indefinitely, or at least until you take positive action to stop it. Once this clock is running you must press the break key to stop it. Halt execution of any Pascal program by pressing Break once. Pressing Break twice terminates the program and returns you to the monitor.

The Write statement in the interior of the program ends with the control codes 15 and 28. Fifteen is the code for suppressing the cursor. (This is for appearance only; the display looks better without the cursor.) The other code, 28, returns the cursor (which although invisible, still controls the print location) to the home position.

A quick way to discover the function of the string containing three blank spaces is to leave them out and observe the results.

Syntax Diagrams I

If you are over 30, you may remember diagramming sentences in school. Diagramming was not just a mild form of child abuse; it taught the syntax rules which guide use of the English language.

Pascal diagrams serve the same purpose. They help you learn what you can and can not do and serve as your reference guide. Since a programming language is far less complex than English, learning the diagrams is not a forbidding prospect.

You can learn to read the Tiny Pascal syntax diagrams before doing any programming or you can do a little programming first and get an idea of what Tiny Pascal can do. When you have some experience, the syntax diagrams are not hard to learn.

Begin with four easy rules:

1. In a syntax diagram a rectangle or square contains something which needs further definition. Look for another syntax diagram to explain the concept.

2. Circles and ellipses enclose things which do not require definition. A circle with a semicolon in it means that a semicolon is needed; it is assumed that you already know what one is. Similarly, an ellipse with the word Letter inside means that a letter of the alphabet is to be used.

3. Arrows indicate direction.

4. Arrows in two or more directions indicate alternative paths.

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ETIM$—Shows the difference between two times.
CLEAR—Specifies the number of file blocks to be allocated when you specify high memory and string space.
DELETE—Allows you to dynamically remove portions of a BASIC program.

In addition to these, there are functions unique to Model II and to Model III. The exclusives to Model II are long error messages and PEEK/POKE. The exclusives to Model III are:

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"Incorporating an expression directly into a Write statement eliminates an additional variable name."

If you have absorbed these four ideas, you already understand a lot. Look at the syntax diagrams on pages 23 through 26 of the *Tiny Pascal Manual*.

Look at the diagram for Program at the top of page 24. Relate the first three rules to this diagram. The word Block needs more definition, provided in the syntax diagram that follows. The circle should contain a period. (It is missing from from my book). Arrows indicate the direction. Program is defined as Block followed by a period.

Try another. On page 25 locate the syntax diagram for Constant. Constants are defined in terms of Identifiers, Integers, Strings, and Hex Integers, all of which have syntax diagrams of their own. Multiple arrows indicate alternative paths. A legal Constant could consist of any one of the four alternatives.

Look at the diagram for Identifier following Constant. Because all of the concepts contained in it are enclosed by ellipses, it requires no other defining syntax diagrams. The words Letter and Digit have the same meaning they do in common usage.

According to the diagram, an Identifier may be a Letter alone, or a Letter followed by a combination of Letters or Digits. ABCDE, A1234, A, AAA, and ABLE2 are all legitimate Identifiers, but 1, 1ABCD, or 975 are not legal.

Be sure you understand the difference between the last two diagrams. A Constant consists of one and only one of the alternatives. In the Identifier diagram, note the way arrows allow looping back and adding more Letters or Digits. The difference is important in understanding more complex diagrams.

For practice interpret the three syntax diagrams on page 26 of the manual. With what you know now you can put the diagrams to practical use. The next time you are unsure about punctuation, or how to use a certain Pascal statement, find the answer in the syntax diagrams.

Controlling the Screen

Review the screen control characters you have already used in Write statements:

- 13 Line feed and carriage return
- 15 Suppress cursor
- 28 Cursor to home position
- 31 Clear screen

Refer to the *Level II Basic Reference Manual*, page C/3, for the complete list. In addition to the screen control codes 0 through 31, other codes achieve special effects. Codes 32 through 95 are for keyboard characters. It is usually unnecessary to use them, but sometimes they are handy. Codes 96 through 127 are for lowercase video display. They only work if your TRS-80 has a lowercase modification. Graphics characters on the TRS-80 are not accessible from the keyboard, but can be displayed with codes 128 through 191. Codes 192 through 255, the space compression codes, can be used in Pascal for tabbing (See Program Listings 5 and 6).

Besides space compression codes, Program Listing 5 uses the expression (N-191)# in the Write statement. Incorporating an expression directly into a Write statement eliminates an additional variable name. This is efficient if the value is used only once in the program and if the expression is not complicated.

The sixth line in Program Listing 6 has three control codes plus the string Hello. Code 218 causes the message to be written 26 spaces from the left side of the screen (192 + 26 = 218). Code 23 converts to the 32-character-per-line print mode. After the timing loop allows you to look at the message for a while, another clear screen and home cursor instruction is executed. Instruction 28 converts back to the 64 character mode.

Program Listing 7 illustrates another control code.

Look at the variable Char in the Read statement. Until now, all variables in Read or Write statements have been followed by # or % to indicate decimal or hexadecimal form. Omitting the symbol stores the ASCII value of the character as Char.

For example, suppose you type the letter Q in response to the prompt. The ASCII value of Q,81, is assigned to Char. When the Write statement is executed a Q appears on the screen, just as it would if you executed the statement WRITE(8,81). The eight backspaces and erases the current character. Without it each letter typed appears twice on the screen, once when input and again when written.

To clear the screen press the Clear key. Since the ASCII code for Clear is 31, the repeat loop ends.

Program Listing 8 is difficult to read because the write statements contain so many numbers and so few words.

It shows the variety of tasks accomplished with these codes. Type and run it; then look at the write statements.

This program prints instructions on the screen to move a truck up or down with arrow keys. The first Write statement clears the screen and spaces down two lines. The next Write statement tabs 30 spaces (192 + 30 = 222), prints an up arrow, and produces a line feed/carriage return. The last write statement follows the same formula: tabs 28 spaces, prints North and skip two lines.

Graphics codes for printing the truck appear in the next two lines between the initial space code and the ending line feeds.

After the truck and the word South below it are printed, you need a down arrow. The down arrow cannot be directly input from the keyboard—that key results in a line feed. Print the symbol on the TRS-80 screen by its ASCII code, 92. You can print any letter or symbol with its ASCII code, but normally do not have to.

The last message should read, "Use the ↑ and ↓ keys to indicate the truck's direction." Because the single quotation mark is the string delimiter, you cannot reproduce that symbol as part of a string. The problem is easily resolved by using the ASCII code for the single quote, 39, instead of the

```
VAR N:INTEGER;
  CHAR:ARRAY(20)OF INTEGER;
BEGIN
  N:=0;
  WRITE('ENTER YOUR NAME ');
  REPEAT
    N:=N+1;
    READ(CHAR(N));
    WRITE(8,CHAR(N));
  UNTIL CHAR(N)=13;
  N:=0;
  WRITE('YOUR NAME IS ');
  REPEAT
    N:=N+1;
    WRITE(CHAR(N));
  UNTIL CHAR(N)=13;
END.
```

Program Listing 10. Saving String

```
VAR TAB,TIME:INTEGER;
BEGIN
WRITE(28,31);
  TAB:=192;
  REPEAT
    WRITE(28,15);
    WRITE(TAB,188,188,188,188,188,190,188,176,176,13);
    WRITE(TAB,143,191,143,143,143,191,143,141,174,159,27);
    TAB:=TAB+1;
    FOR TIME:=1 TO 50 DO;
  UNTIL TAB=247
END.
```

Program Listing 11. Moving Truck

mark itself.

Do You Need Arrays?

Tiny Pascal allows integers and single dimension integer arrays. Like integers, arrays must be declared before they are used. The format of the declaration statement follows:

```
VAR N,SUM,HIGH,LOW,COUNT:INTEGER;
  SCORE:ARRAY(25) OF INTEGER;
```

In addition to the five integer variables in the first line, we have declared an array named Score containing 25 variables.

More than one array can be declared. If multiple arrays are of the same size, they can be declared together, as:

```
SCORE,IDNUM:ARRAY(25)OF INTEGER;
```

If arrays are of different size, they must be declared separately, as:

```
SCORE:ARRAY(25)OF INTEGER;
IDNUM:ARRAY(15)OF INTEGER;
```

Arrays free the programmer from the tedium of naming many variables separately. Since arrays handle related variables, they are most often used with loops. Program Listing 9 uses a For. . . Do loop to input test scores, accumulate a sum, and search for high and low values.

Before the For. . . Do loop is executed, certain variables used in the program are initialized. The variables, Sum, Low, and High are the only ones requiring initialization. Values are assigned to the others during the program before use in a comparison or assignment statement. Variables are usually initialized to zero. This program searches for the lowest value among the scores entered, and assigns that value to the variable Low. If Low were initialized at zero, a lower value would never be found. The original value is set to 100 to be sure that the lowest score input is eventually stored in Low. If variables are not initialized at the start of the program they may contain values left from the previous run or other garbage.

The last Write statement contains the instruction (SUM DIV N)#. Rather than use an extra variable name to compute the mean score, the operation is within the Write statement. The mean is not needed for any other operation and its computation is simple and efficient.

The test score program could be refined by rounding the mean to the nearest integer. Add the variable Mean to the declaration statement and replace the last Write line with the following three lines:

```
MEAN: = SUM DIV N;
IF(SUM MOD N)>(N DIV 2)THEN MEAN: = MEAN + 1;
WRITE('THE MEAN IS',MEAN#,'.');
```

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"The Pascal counterpart to Basic's Set and Reset is a single command called Plot, used to turn pixels both on and off."

In English this translates to: If the remainder of Sum divided by N is larger than half of N, round up by adding one to the mean.

As an exercise, write a variation of Test Scores that does not require N to be entered. The user signals the end of the test score data by entering a negative number. Try a Repeat or a While statement in place of the For. . . Do loop which requires that N be known in advance.

```
VAR H,V,DIR,STOP:INTEGER;
BEGIN
  WRITE(28,31);
  H:=0;V:=0;STOP:=0;
  PLOT(H,V,1);
  REPEAT
    REPEAT
      DIR:=INKEY
    UNTIL DIR<>0;
    PLOT(H,V,0);
    IF DIR=91 THEN V:=V-1;
    IF DIR=10 THEN V:=V+1;
    IF DIR=9 THEN H:=H+1;
    IF DIR=8 THEN H:=H-1;
    PLOT(H,V,1);
    IF DIR=83 THEN
      BEGIN
        WRITE('THE COORDINATES ARE ',H#,' AND ',V#)
        STOP:=1;
      END;
    DIR:=0;
  UNTIL STOP=1
END.
```

Program Listing 12. Coordinate Finder

Tiny Pascal does not allow string variables. Program Listing 10 shows a way to store and retrieve a string. It is not too practical—a separate array is needed for each string.

To make the routine more elegant, I borrowed a couple of lines from the typing practice program, in which the computer reads a character, backspaces to erase it, and then writes it back. In this version, each time a character is read, its ASCII code is assigned to the array Char, continuing until Enter is pressed. A second Repeat. . . Until cycle writes back the name which has been stored in the array. No # symbol follows the variable name when the string is written to the screen. You want the character represented by the ASCII code printed, not the code itself.

Graphics

Tiny Pascal creates screen graphics in three ways. You have already seen one program using graphics, the truck program.

To refresh your memory, Program Listing 11 is a variation of Truck. Since it contains nothing new, you will understand how it works just by reading the code.

The two lines of graphics codes are similar to the ones which produced the stationary truck. Remember the space compression codes? The variable Tab, initialized to 192, is incremented by one each time the Repeat. . . Until loop is executed. The two lines of graphics codes are written over and over, each time one space further to the right. The cycle is repeated very rapidly and the timing loop slows it down.

The TRS-80 screen is divided into 6,144 picture elements (pixels). Any pixel is identified by a pair of coordinates; the first one refers to the horizontal position (0 to 127); and the second refers to its vertical position (0 to 47). Each keyboard and graphics character is two pixels across and three down. The dimensions of the screen are 64 by 16 expressed in print locations, and 128 by 48 expressed in pixels. Level II Basic uses Set and Reset to turn each of these locations on and off. Set(0,0) turns on the pixel in the upper left corner of the screen; Reset (0,0) turns it off again.

```
(*WHITE PAINT*)
VAR PAINT:INTEGER;
BEGIN
  FOR PAINT:=15360 TO 16383 DO MEM(PAINT):=191
END.
```

Program Listing 13. White Paint

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The Pascal counterpart to Basic's Set and Reset is a single command called Plot, used to turn pixels both on and off. Plot uses three arguments: The first and second are the coordinates, and the third is the on/off indicator. An odd number in the third spot tells the computer to turn that location on. Plot(H,V,1) is the equivalent of Set(H,V); conversely, Plot(H,V,0) means that the pixel represented by coordinate pair H,V is to be turned off.

Run Program Listing 12 to try Plot. As before, explain the program to yourself before running it.

With the arrow keys, the user moves a point of light around the screen. To stop, press S. The coordinates of the location are printed on the screen.

The second Repeat loop in Coordinate Finder has the statement, DIR: = INKEY, similar to INKEY$ in Basic. When you press an arrow in this program, you assign the ASCII value of the key to Dir: 8,9,10, or 91, depending on which direction you are going.

The first four If statements increase or decrease H or V by one to prepare to plot the next point. When you press S, the coordinates of the current location are printed and the variable Stop is set to one. This signals the end of the program. If some other key is pressed, Dir is set back to zero and execution of the loop continues.

The line Plot(H,V,0) turns off the point turned on during the last pass through the loop. If you remove this line, a trail of points already plotted is left on the screen.

Plot graphics like Set graphics, are slow. Mem graphics, like Poke graphics, are fast-

```
(*BABY ELEPHANT*)
VAR LC,ROW,N:INTEGER;
   E:ARRAY(39)OF INTEGER;
BEGIN
   WRITE(28,31);
   E(1): = 160;E(2): = 188;E(3): = 191;E(4): = 191;
   E(5): = 191;E(6): = 191;E(7): = 191;E(8): = 189;
   E(9): = 188,E(10): = 191;E(11): = 187;E(12): = 188;
   E(13): = 144;E(14): = 151;E(15): = 175;E(16): = 191;
   E(17): = 159;E(18): = 143;E(19): = 143;E(20): = 175;
   E(21): = 191;E(22): = 159;E(23): = 131;E(24): = 163;
   E(25): = 191;E(26): = 133;E(27): = 136;E(28): = 142;
   E(29): = 143;E(30): = 141;E(31): = 128;E(32): = 128;
   E(33): = 142;E(34): = 143;E(35): = 141;E(36): = 130;
   E(37): = 131;E(38): = 129;E(39): = 128;
   LC: = 15769;
   ROW: = 0;
   REPEAT
      FOR N: = 1 + ROW TO 13 + ROW DO
         BEGIN
            MEM(LC): = E(N);
            LC: = LC + 1;
         END;
      ROW: = ROW + 13;
      LC: = LC + 51;
   UNTIL ROW>26
END.
```

Program Listing 14. Baby Elephant

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The Snappware College Educated Garbage Collector (SNAPP-VI) is an intelligent processing function which greatly improves performance of typical BASIC applications. And here's why.

Microsoft uses a 'variable length string' in the BASIC interpreter. Each time the string is assigned a new value, it is relocated in a string pool. Periodically the string pool must be reorganized and condensed into a single contiguous area. Performing this string space reclamation is time consuming and inefficient because this approach evaluates and collects each string individually. The time required is roughly proportional to the square of the number of active strings in the resident program. During reclamation the system seems to 'lock-up' and does not respond to the operator until the process is completed.

This time consuming approach requires a better solution. Snappware has developed a solution which takes advantage of the auxiliary memory available. SNAPP-VI requires only four bytes per active string as a work area. When free storage space is available, our system temporarily borrows, uses and returns the space to the free storage pool when completed. If storage is not available, our system will temporarily transfer out to disk enough of the BASIC program to make room for our work area and return the 'paged out' information to its correct location when completed.

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"In Tiny Pascal Mem does the work that both POKE and PEEK perform in Basic."

er. Here's a direct comparison of the two:

```
POKE 15360,191
MEM(15360) = 191
```

The TRS-80 has 1,024 video display locations (64 characters per line times 16 lines) occupying memory addresses 15360 to 16384. The Basic Poke command assigns the value 191 to memory location 15360. The second statement is the Tiny Pascal equivalent. The graphics code 191 sets all six pixels of a video display location. Use this code to paint the entire screen white (See Program Listing 13).

Program Listing 14 contains a graphics figure which extends over three lines on the screen. The second line of graphics characters begins 64 locations after the beginning of the first line and the third line begins 64 locations after the second.

Baby Elephant illustrates two shortcomings of Tiny Pascal. One is the lack of multi-dimensional arrays. We get around this by putting all data into a single array and nesting a For. . . Do loop inside of a Repeat loop.

The other deficiency is less easily overcome. Tiny Pascal has no equivalent of Basic's Data statement. The only way to assign the 39 values to the E array is by writing 39 separate assignment statements.

Creating screen graphics is only part of the power of Mem. A machine language program can be POKEd directly into memory with Mem. The built-in function Call provides access to the machine language routine from Tiny Pascal (just as the USR function allows access from Level II Basic to a machine language routine).

Mem can also peek into memory locations by turning the assignment statement around (See Program Listing 15).

The line What: = Mem(LC) transfers the value of memory location LC to the variable What. In Tiny Pascal Mem does the work that both POKE and PEEK perform in Basic.

```
VAR LC,WHAT:INTEGER;
BEGIN
  WRITE('ENTER A MEMORY LOCATION—'13);
  READ(LC#);
  WHAT: = MEM(LC);
  WRITE('MEMORY LOCATION ',LC#,' CONTAINS ',WHAT#,' (DECIMAL) ',WHAT%, '(HEX)');
END.
```

Program Listing 15. What's In Here

Add One to Your Bibliography

In addition to the books recommended in the *Tiny Pascal Manual*, I suggest David L. Heiserman's *Pascal* from Tab Books. It is valuable because it has many program examples which run in Tiny Pascal without modification. (But watch out for typographical errors.)■

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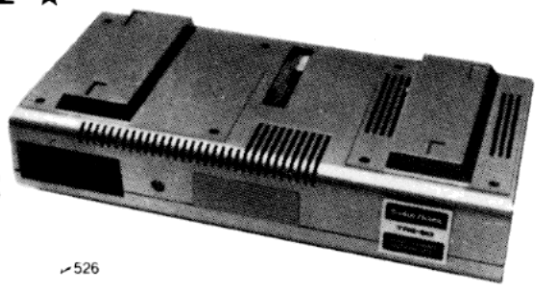

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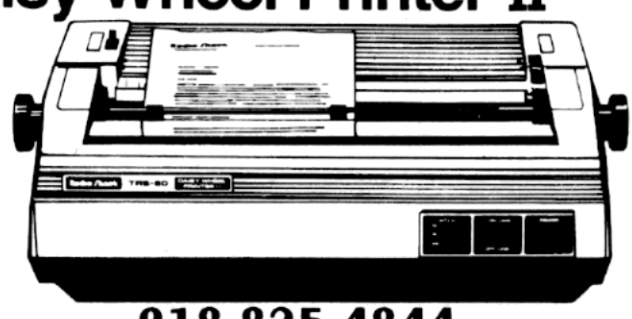

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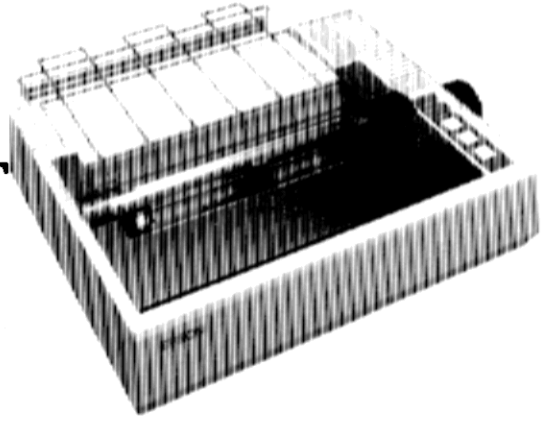

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Cobol (COmmon Business Oriented Language) was created in the 1950s to handle large amounts of information. It is file oriented with an emphasis on controlling data storage, retrieval and manipulation. But it is a rich language and not limited only to file handling.

Programs are written using descriptive words so comment lines (such as REM in Basic) and external documentation are seldom necessary. Have you ever taken a complicated Basic program written by someone else and tried to figure out what he was thinking when he assigned variables and set up the program procedure? It's much easier to decipher Cobol programs.

Unlike Basic, which has a very liberal composition style, Cobol has a rigid structure. There is no such thing as a one line Cobol program. Every program must contain certain information in a particular order. While Cobol programs are longer than those written in Basic, it is no more difficult to write in one language than the other. Programs are longer due to the use of complete words and phrases and extra divisions used for initially describing files and storage areas. Cobol programs must be structured since it is a language compiled into an object code, the machine's mother tongue. As a result, Cobol is fast ... impressively fast! But, it lacks the flexibility of Basic.

For example, you are writing a program which stores data in a file. You are debugging it and the information is not being retrieved properly. Does the error lie in your write programming or your read programming? It is easy to check whether the correct information has been getting on the disk by entering: OPEN"R",1,"filename":FIELD1,255 AS A$:GET 1,1:PRINT A$. Debugging tricks like this are not easily done in Cobol.

```
IDENTIFICATION DIVISION.
PROGRAM-ID.        SAMPLE.
AUTHOR.            DISCHERT/KEEN.
ENVIRONMENT DIVISION.
CONFIGURATION SECTION.
SOURCE-COMPUTER.   MODEL-II.
OBJECT-COMPUTER.   MODEL-II.
INPUT-OUTPUT SECTION.
FILE-CONTROL.
     SELECT NAMES-FILE
          ASSIGN TO RANDOM "INDEX/DAT"
          ORGANIZATION IS INDEXED
          ACCESS IS DYNAMIC
          FILE STATUS IS ERROR-STATUS.
DATA DIVISION.
FILE SECTION.
FD NAMES-FILE
     BLOCK CONTAINS 1 TO 256 CHARACTERS
     LABEL RECORDS ARE STANDARD
01   NAME-DETAIL
     02   NAME        PIC X(20).
     02   ADDRESS     PIC X(20).
WORKING-STORAGE SECTION.
01   ERROR-STATUS     PIC XX.
PROCEDURE DIVISION.
BEGINNING-DISPLAY-ROUTINE.
     DISPLAY "<A>DD A NAME" LINE 4 POSITION 30.
     DISPLAY "<R>ETRIVE A NAME" LINE 6 POSITION 30.
```

Program Listing. Sample Cobol Program Section.

Four Divisions

Programs are written in sentence and paragraph form, complete with periods. Four fundamental divisions are required and each can be broken down into smaller sections and paragraphs. Here is what each division does.

In the Identification Division the program name is identified. It also gives you the opportunity to brag a little under the author's name heading. You can fill this division with remarks, date written, date compiled, and the like. Everything here is optional, with the exception of the program identification. When you save the program on disk, you must give it the same file name you have specified in Program-ID.

Next, you must go to the Environment

Division. The computer needs to know the type of computer the program was created and compiled on. At this time, devices are assigned, such as disks, printers, card files and so on.

The files you are going to use must be described and their records organized. This is done in the Data Division. A Working-Storage section creates areas which can be used for temporary storage of items and setting up headings or columns for applications such as paper printouts.

Observations

Now for the Procedure Division, Fig. 1 shows a sample piece of a Cobol program listing. There are some interesting observations that the Basic programmer will notice as he studies this language: If . . . Else is the same in Basic and Cobol (except the word Then is not used in Cobol); Arithmetic signs +, −, *, / are the same, but you have the added option of spelling out the operations in Cobol. You can use full words as variables. For example: Subtract payment from principal giving balance-due, where subtract, from, and giving are reserved words.

Basic's fielding is accomplished with the picture clause. Each data item is given a name and the number of characters it will require space for is specified. Here, a customer's name requires 20 positions: CUSTOMER-NAME PICTURE X(20).

There are no subrecords to worry about in Cobol. It is our understanding that a write command (analagous to Put) may not actually put the record on disk until a buffer is full. This is done internally and invisibly to the user. As in Basic, Close puts any remaining records in the buffer on disk.

There are a few statements that have no equivalent in Basic. A Call file name will run another program from the program which is currently executing. But this is different than the line: 100 RUN"filename", for example, in Basic. First, there are ways of passing variable values between the programs. Secondly, the called program knows where it came from. When an Exit is encountered in the called program, operation returns to the sending program.

Here is a powerful statement: Perform. This can take on many formats, and each is a powerful tool:

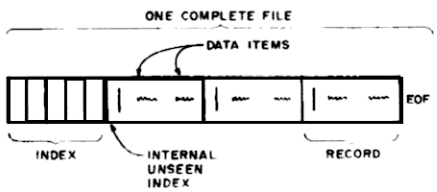


Fig. 1. Physical layout of Indexed Sequential File.

```
PERFORM procedure-1 THRU procedure-2 UNTIL
condition is true.
PERFORM procedure-1 VARYING identifier.
```

And the list goes on with variations!

Looping

Cobol doesn't have a For...Next statement but there are ways of looping. Here is a simple line that is the equivalent of a GOSUB and an If all rolled into one: PERFORM SEARCH-ROUTINE UNTIL NAME = "CLAUS, SANTA". A paragraph entitled Search-routine could pull in records in a file and each name could be checked for a match. In actual practice you would want a check for the End Of File marker so you can bail out if the end is encountered. Otherwise, if there is no Claus, Santa in the file, you'll be trapped in an endless loop!

Two simple looping methods come to mind. A variable can be set up and incremented:

```
WORKING-STORAGE SECTION.
77 COUNTER PICTURE 999.
PROCEDURE DIVISION.
START.
    MOVE ZERO TO COUNTER.
PROCESS-ROUTINE.
    —text—
    ADD 1 TO COUNTER
    IF COUNTER = 10 GO TO CLOSE-ROUTINE.
    GO TO PROCESS-ROUTINE.
```

("ADD 1 TO COUNTER" could also have been written "COMPUTE COUNTER = COUNTER + 1" and "MOVE ZERO TO COUNTER" could be "COMPUTE COUNTER = 0".) Or loops can be handled by the perform statement: PERFORM paragraph-name 10 TIMES.

One of the biggest contrasts between the two languages is the way files are set up. Files are chosen in the Environment Division, that is, the storage medium is selected and the file name is given. Then they are described in the Data Division. A record is broken down into its various parts and the length of each part is set up. Files are processed in the Procedure Division, being opened, closed, read from and written to.

Something we have been trying to do in Basic for a long time but have not had much success with is sorting. Having a disk full of names and addresses, for example, arranging them in alphabetical order with Basic is a problem, especially when there are too many names to be pulled into RAM to manipulate or when you have only one disk drive so you can't create a temporary file.

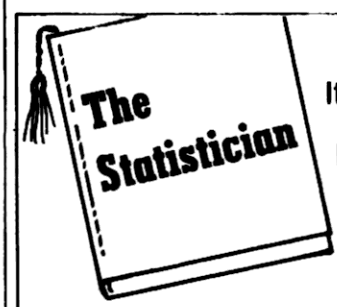
This is a snap in Cobol and it's done using Indexed Sequential Files. The physical layout of such a file is shown in Fig. 1. As you can see, this type of file has a section tagged onto the front of it containing the locations of each record in the file the way a book has an index.

When an alphabetical sort needs to be done, only the index is rearranged, not all the records in the file. Then printouts or displays can be done in order, as the index points to where in the file to get the next data record.

Cobol

We learned Cobol by devouring all the self-teaching books we could get our hands on. For the most part, Radio Shack Cobol stays true to the American National Standard. The main discrepancies occur in device handling; these differences include setting up and accessing the video display, keyboard, disk, and printer. However, they posed no serious problem in learning or working with their systems.

Cobol is not hard, but you should spend a lot of time studying the rules of the language. The commands and statements (reserved words) are usually descriptive words, so although there are many of them, they can be learned without too much trouble. ■



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The Key Box

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Pocket Portfolio

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When Radio Shack offered a 20 percent discount on the Pocket Computer, I bought one, thinking at last I could afford it for a toy. It didn't take me long to learn that the Pocket Computer is anything but a toy, once you get in tune with its Basic differences from its big brothers.

My first experiment in Pocket Computer programming was a program for keeping track of the small portfolio of stocks that I try to maintain as a speculative venture. It's entertaining to check the market page in the daily paper and see if the last New York Stock Exchange session made me richer or poorer, but, when I have more than one or two stocks, I find it difficult to keep track of what each one was selling for yesterday and of how much I paid for it in the first place. I wanted to keep a kind of running inventory that would summarize my profit or loss on each investment.

Because of its program storage feature, the Pocket Computer's programs can be consulted at any time without the necessity of re-entering them by keyboard or tape. A great advantage of this facility is the set of 26 permanently storable variable registers. Each of these registers can be programmed for automatic updating every time the user enters the program.

Besides the storable variables there are a number of spaces of flexible memory available for temporary use during the actual operation of the program. The number varies according to the space used by other program operations and, of course, the space occupied by the program itself.

Although the following stock portfolio program is extremely simple, it illustrates some of the more interesting and unique aspects of the Pocket Computer.

There are 26 storable variables in the Pocket Computer's memory system, usable either as numerical or as character space. The following program assigns them numerical values within the permissible range, A(1) to A(26). For example, the six stocks followed by the program use spaces A(1) through A(6). Note in lines 2, 6, 10, etc. that these are updated by pause reminders followed by input prompts. Fixed memory spaces A(7) through A(12) are employed as permanent repositories for the purchase prices of the six stocks. Thus, in this program a total of 13 stocks could be handled using the available fixed memory, A(1) through A(13) for the last and current prices, A(14) through A(26) for the purchase prices.

When entering the program, insert your own ticker symbols in lines 2, 6, 10, 14, 18, 22, etc., and your own per share purchase prices and number of shares held, respectively, at the beginning and end of lines 3, 7, 11, 15, etc.

Memory positions A(27) and above cannot save data beyond

```
 1: REM 'STOCK PORTFOLIO PROGRAM * BY EDWIN DETHLEFSEN'
 2: BEEP 1: PAUSE"CHL LAST "; A(1): INPUT"CHL CURRENT "; A(1)
 3: A(7) = 51: A(27) = (A(1) – A(7))*100
 4: PRINT"PROFIT = "; A(27)
 6: BEEP 1: PAUSE"SGA LAST "; A(2): INPUT"SGA CURRENT ";A(2)
 7: A(8) = 13.6: A(28) = (A(2) – A(8))*400
 8: PRINT"PROFIT = "; A(28)
10: BEEP 1: PAUSE"TAN LAST "; A(3): INPUT"TAN CURRENT ";A(3)
11: A(9) = 52: A(29) = (A(3) – A(9))*300
12: PRINT"PROFIT = "; A(29)
14: BEEP 1: PAUSE"GRI LAST "; A(4): INPUT"GRI CURRENT ";A(4)
15: A(10) = 18.75: A(30) = (A(4) - A(10))*200
16: PRINT"PROFIT = "; A(30)
18: BEEP 1: PAUSE"WSCI LAST "; A(5): INPUT"WSCI CURRENT "; A(5)
19: A(11) = 11.75: A(31) = (A(5) – A(11))*100
20: PRINT"PROFIT = "; A(31)
22: BEEP 1: PAUSE"FEXC LAST "; A(6): INPUT"FEXC CURRENT "; A(6)
23: A(12) = 23: A(32) = (A(6) – A(12))*100
24: PRINT"PROFIT = "; A(32)
49: REM COMPUTE TOTAL PROFIT *
50: A(33) = A(27) + A(28) + A(29) + A(30) + A(31) + A(32)
51: BEEP 1: PRINT"TOTAL PROFIT = "; A(33)
55: END
```

Program Listing

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the manual:

"It definitely rates the first '10' given to any documentation reviewed in this column." (A.A. Wicks, COMPUTRONICS, October, 1981)

the software: "An excellent Word Processor" (D.H.); "Absolutely fantastic" (S.E.S.); "You have features that I cannot duplicate on my $14,000 system" (J.B.)

the support: "Your phone information system and the prompt and courteous staff that you provide to help your clients...are worth the cost of the system." (V.H.H.)

REQUIRED CONFIGURATION: 48K TRS-80 with one disk drive. Specify Model I or Model III.

† *Some features work only if your printer has the mechanical capability.*

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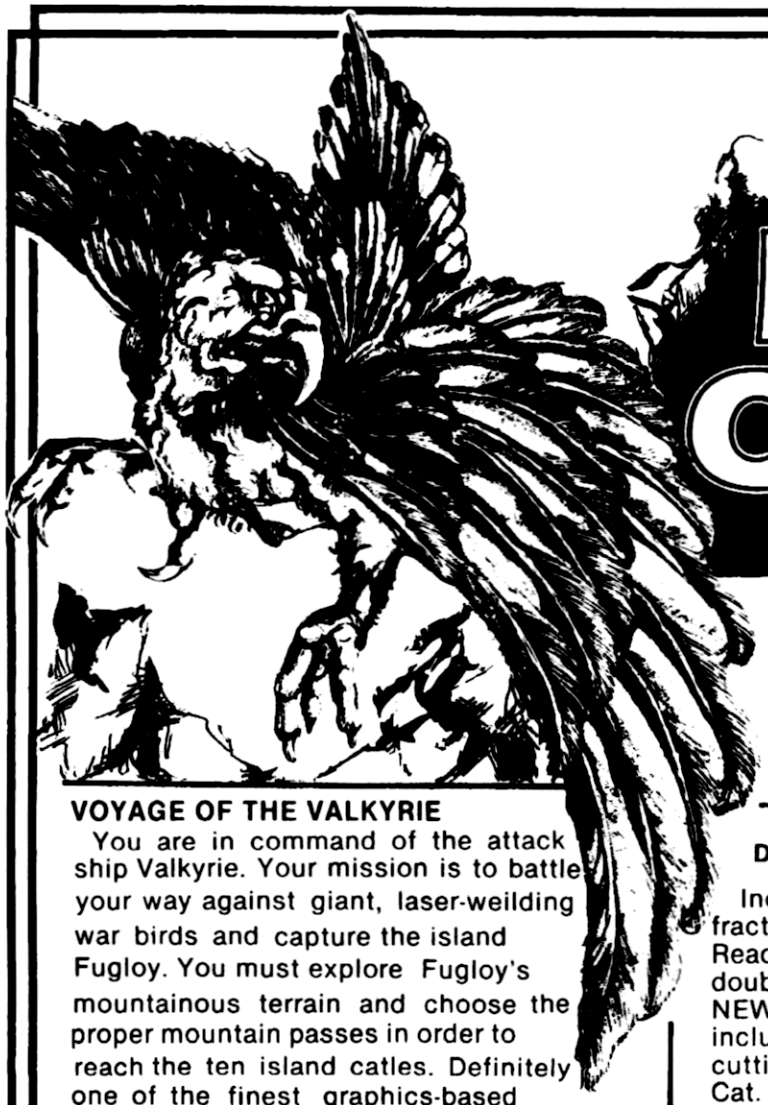

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use in a given program run. In this program A(27) through A(33) are used for information that is to be used once and then discarded. A(27) through A(33) represent the differential between purchase cost and current value of each stock, while A(33) is the total profit (loss) represented by the sum of current values of the stocks in the portfolio.

Note that ticker symbols and purchase prices can be altered simply by line editing. The odd-numbered lines multiply the difference between purchase and current prices by number of shares held, so that profit can be evaluated. The beep in the beginning and every third line calls audible attention to the coming flash of data providing the last recorded price for each stock ticker in the portfolio. It's important to remember, however, that once a current value is input the last value is lost, since the current value replaces it in the same fixed memory slot.

To record last and current values of the portfolio as a whole, one can simply add lines.

```
52: BEEP 1: PAUSE "LAST PF VAL
= "; A(13)
53: A(13) = (A(1)*100) + (A(2)*400) +
(A(3)*300) + (A(4)*200) + (A(5)*100)
(A(6)*100): REM SUM OF CURRENT
PRICES X #SHARES
54: PRINT "CURRENT PF VAL = ";
A(13)
```

Since the Pocket Computer's value depends on the number and availability of accessible programs, it's important to keep to a minimum the amount of memory tied up by any given program. Therefore, to make more space for other programs, the user may want to eliminate such luxuries as the beep. With a larger portfolio it might be economical to store the tickers as strings, and provide a subroutine for the calculations in the odd-numbered lines. On the other hand a GOSUB instruction takes as much memory space as a ticker symbol, so it is doubtful whether a subroutine has value in a program this brief. ■

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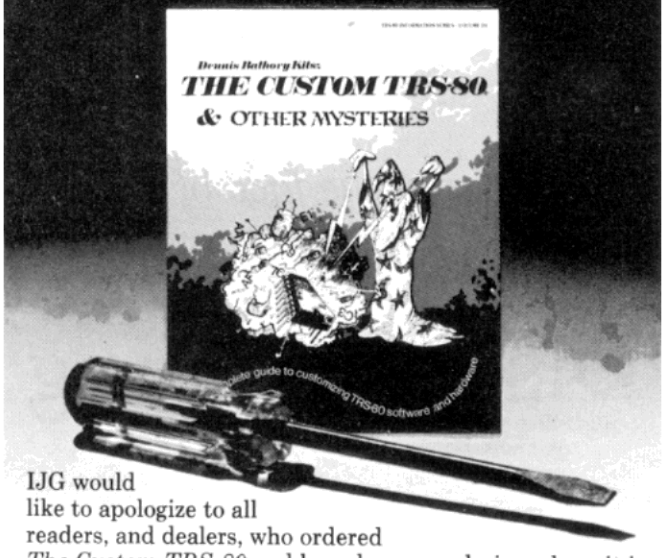

IJG would like to apologize to all readers, and dealers, who ordered *The Custom TRS-80* and have been wondering where it is.

Magazine advertisements have to be prepared 2 to 3 months before they actually appear in print. Originally the book was scheduled for printing in early May, just as the first advertisements were to appear, but the Editor must have been in a time-warp when he made the original production estimates!

He completely under-estimated the time needed to prepare and process the dozens of photographs, circuit diagrams, printed circuit layouts, assembly language programs and reams of information that Dennis Kitsz had provided.

The book has now been scheduled for printing in early November, and should be available before the end of the month. It will be worth the wait, it's one heck of a book!

Credit card orders are not being processed until the book is back from the printers. If you prepaid by check, and would prefer not to wait, then you can obtain a full refund prior to shipment – or use your credit towards other IJG products.

Sorry about this, thank you for waiting,

Jim Perry

•

Jim (*'What year is it?'*) Perry, Editor

IJG

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LOAD 80

The Key Box

Basic Level II
Model I
16K RAM

Plot prices in the face of ever increasing materials costs.

Discriminating Pallets

John D. Eaton
P.O. Box 1215
Atlantic Beach, NC 28512

During these times of accelerated inflation those of us responsible for the administration of a business must react rapidly to increasing costs of the products we purchase for resale. The length of time between increased cost and our calculation and announcement of a new sales price is critical. Revising selling prices is time-consuming and arduous, but days of delay mean thousands of dollars lost.

My company produces wooden pallets used in goods shipments. Manufacturers' prices vary from $2 to over $20 each, depending on materials used, amount used, and complexity of construction. Pallets differ in physical dimensions, quality of materials, and the cost of labor to manufacture, and are usually sold in large quantites.

Program Listing 1 is a portion of a major program easily adaptable to individual needs. Lines 10 to 30 initialize the cost of the three basic materials used in pallet manufacturing: runners, boards and nails. These products change cost frequently and are the major cause of repricing. With these costs as variable inputs, we can easily figure increased cost and forecast results of mark-up, waste or profits variations.

Many pallet shops "round up" to allow for materials wasted in manufacturing. The shop may round off a board at 48″ when a 46″ piece is used, for example (see Table 1).

The cost of waste materials is an element in the shop's selling price. Other factors are mark-up to cover cost of inventory (interest), labor and all other overhead. We must consider even the labor cost of unloading and stacking the lumber in the yard (generally added as the cost per thousand board feet). In this program we enter the "selling price" of lumber, nails, and other materials after these considerations.

Line 38 reduces the input to the selling price per unit of measure (per board foot or by nail).

Line 35 gives the user an opportunity to redo any of the requested data before execution.

Line 41 multiplies the board feet in the runners (a constant) by the input selling price and assigns the total price to D. Line 42 figures the total price of deck boards, and line 43 calculates the price of nails. We enter labor, overhead and profit in a data list because these costs change only about once a year.

The subroutine in lines 1100 through 1115 calculates total pallet cost and prints the results. Line 1000 resets the variables as the program moves from pallet to pallet. The program duplicates this process for each item priced.

I enjoy this convenience when adding or deleting items. Spend

a little effort developing the calculations for your business, and you will be handsomely rewarded. ■

44 x 46" Pallet

Qty.	Actual Size	Description	Rounded Size
3	2" x 4" x 44"	Runners	2" x 4" x 48"
7	1" x 6" x 46"	Top Boards	1" x 6" x 48"
3	1" x 6" x 46"	Bottom Boards	1" x 6" x 48"

Table 1. Example of Materials List for One Pallet

Variable
- D = Runners in board feet x cost (A)
- E = Deck boards in board feet x cost (B)
- F = Number of nails x cost (C)

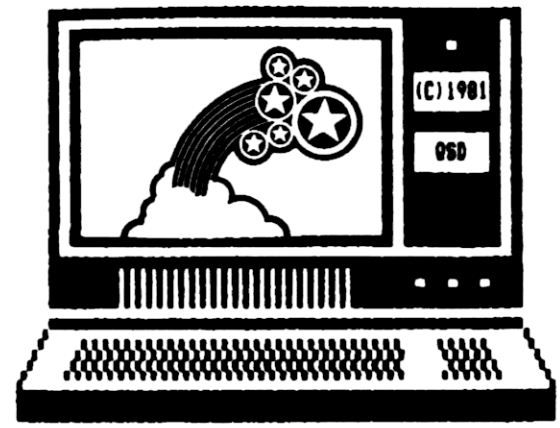
Note: Board feet and nail quantity has been supplied by the customer or computed by the shop staff in original quote.

Table 2

```
2 REM PALLET RE-PRICING SCREEN PRINT VERSION
3 COPYRIGHT (1978) BY JOHN D. EATON P.O. BOX 1215 ATLANTIC
BEACH N.C. 28512
4 CLS
5   K=0
10  INPUT "1)WHAT IS THE SELLING PRICE OF RUNNER MATERIAL PER 10
00 BOARD   FEET";A
15  IF K=3 GOTO 35
20  INPUT "2)WHAT IS THE SELLING PRICE OF DECK BOARD MATERIAL PE
R 1000      BOARD FEET";B
25  IF K=3 GOTO 35
30 INPUT "3)WHAT IS THE SELLING PRICE OF NAILS PER 1000";C
35  INPUT "IS THE COST YOU INPUT CORRECT?  (YES OR NO)";A$:IFA$=
"YES"GOTO38
36  K=3:PRINT "WHICH INPUT DO YOU WISH TO CHANGE (1) (2) OR (3).
  PLEASE ENTER THE NUMBER TO BE CHANGED."
37  INPUT Q:ON Q GOTO 10,20,30
38 A=A/1000:B=B/1000:C=C/1000
39 CLS
40  PRINT "***** APEX PRODUCTS 40X32 (2-WAY)"
41  D=5.28*A
42  E=3.57*B
43  F=28*C:READ G
44  GOSUB 1100
45  GOSUB 1000
50  PRINT "***** APEX PRODUCTS 43X35 (4-WAY)"
51  D=8*A
52  E=4.5*B
53  F=54*C:READ G
54  GOSUB 1100
55  GOSUB 1000
60  PRINT "***** BLADEN COMPANY 54X35 (4-WAY)"
61  D=10*A
62  E=5*B
63  F=60*C:READ G
64  GOSUB 1100
65  GOSUB 1000
70  PRINT "***** BLADEN COMPANY 56X52 (4-WAY)"
71  D=10*A
72  E=8*B
73  F=72*C:READ G
74  GOSUB 1100
75  GOSUB 1000
76  INPUT "PRESS 'ENTER' TO CONTINUE";Z$:CLS
80  PRINT "***** COLUMBUS COMPANY 56X44 (4-WAY)"
81  D=10*A
82  E=6*B
83  F=72*C:READ G
84  GOSUB 1100
85  GOSUB 1000
90  PRINT "***** COLUMBUS COMPANY 43X73 (4-WAY)"
91  D=8*A
92  E=8.16*B
93  F=48*C:READ G
94  GOSUB 1100
95  GOSUB 1000
100 PRINT "***** COLUMBUS COMPANY 56X73 (4-WAY)"
101 D=9.9*A
102 E=10.2*B
103 F=60*C:READ G
104 GOSUB 1100
105 GOSUB 1000
106 INPUT "PRESS 'ENTER' TO CONTINUE";Z$:CLS
1000 D=0:E=0:F=0:G=0:H=0
1001 RETURN
1005 DATA 1.25, 1.70, 1.25, 1.80, 1.80, 1.95, 1.95
1100 PRINTTAB(2)"2X4'S";TAB(12)"DECK BDS";TAB(25)"NAILS";TAB(35)
"LABOR & O.H.";TAB(49)"TOTAL"
1105 H=D+E+F+G
1107 X$="$$#.## - + -"
1114 PRINT USING X$;D,E,F,G,H
1115 RETURN
```

Program Listing

✓See List of Advertisers on page 402



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BASIC/S II is a BASIC compiler for a powerful subset of TRS-80 Disk BASIC (Mod I/III) which is itself written in BASIC, but now is a stand alone / CMD file compiled by BASCOM(c), and is FAST! (previously sold as BASIC/S 3.1) It runs under almost ANY DOS, Mod I or III (as do the /CMD files it generates).

BASIC/S II will compile BASIC programs up to about 10K in size (but since one compiled program can run another with no loss of variables, this is not a serious limitation). Variables allowed are integers and strings (A-Z and A$-Z$) and also arrays of integer and string (1 or 2 dimensions). Array names can be any length, with all characters significant. Integer arithmetic is limited to addition, subtraction, multiplication, and division with at most two operands on the right hand side (eg A=B*C or Z=D/F). Array elements may be used here as usual, as may constants (as in A=ARRAY (7) *5, for example).

Most Level II string functions are supported: INSTR, STR$, VAL, CHR$, ASC, LEFT$, RIGHT$, MID$, INKEY$. Complex string formulae are not allowed (thus you can't say A$=LEFT$ (X$+Y$,2); you would need to say something like B$=X$+Y$:A$=LEFT$(B$,2), instead.

Disk I/O IS supported, both sequential and random (with LRL < 256 as well). You can have up to 10 files open at one time, and two of them may be random files. Disk statements that are supported include OPEN, CLOSE, LINE INPUT #, PRINT # FIELD, LSET, GET, PUT, LOF, EOF, CVI, and MKI$.

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LZAP/CMD is the most powerful, easy to use ZAP routine ever written, and it is for LDOS Mod I or III! LZAP uses the resident drivers of LDOS, thereby taking FULL ADVANTAGE OF THIS POWERFUL OPERATING SYSTEM. LZAP will auto-configure itself to drive capacity. It will support any # of drives from 0-7, any cylinder count up to 255, and any sector # to 255. Will page between double sided drives, 8" drives, LX-80, and hard drive, 5" floppies of all sizes at same time without getting lost!

Contains these features:

(R) ead	(E) xit	(D) ebug)	(R) emove Password
(A) scii Modify	(C) compare	(G) o Directory	(I) Go Extent
(M) odify Hex	(W) rite	(B) Locate Byte	(Z) ero buffer
(F) ind file	(H) ash code	(L) ocal search	(P) rint screen
(S) earch Global	(X) Escape	(T) oggle	0-7 page drive

(space bar) brings up a command menu for learners and QUICK reference at any time! Also contains an ERROR DICTIONARY that can be turned off to override those crashed or protected files for examination.

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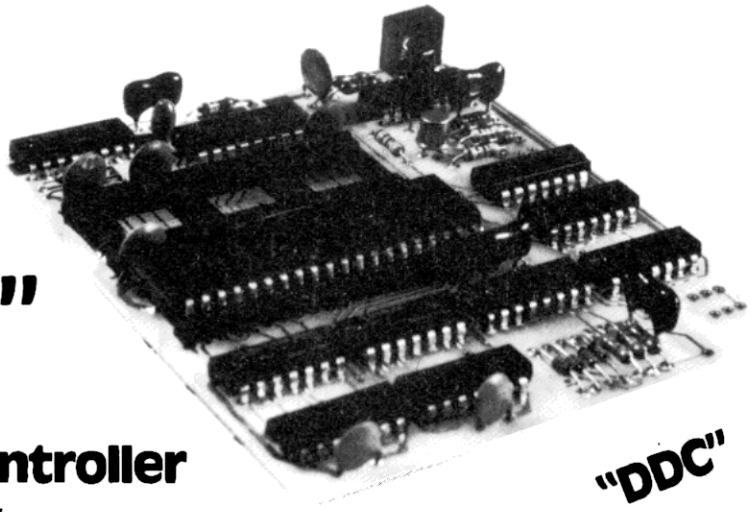

Double Density Controller

★ Technical Superiority

At last! A double density controller for Model I with HIGHER PROBABILITY OF DATA RECOVERY THAN WITH ANY OTHER DOUBLE DENSITY CONTROLLER ON THE MARKET TODAY! The "DDC" from Aerocomp. No need to worry about the problems that keep cropping up on existing products. AEROCOMP'S new analog design phase lock loop data separator has a wider capture window than the digital types currently on the market. This allows high resolution data centering. The finest resolution available with digital circuitry is 125 ns (nano seconds). The "DDC" analog circuit allows infinately variable tuning. Attack and settling times are optimum for 5-1/4 inch diskettes.
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The bottomline is state of the art reliability!

★ Test Proven

Tests were conducted on AEROCOMP'S "DDC", Percom's "Doubler A"* and "Doubler II"* and LNW's "LNDoubler"** using a Radio Shack TRS80*** Model I, Level 2, 48 K with TRS80 Expansion Interface and a Percom TFD100* disk drive (Siemens Model 82). Diskette was Memorex 3401. The test diskette chosen was a well used piece of media to determine performance under adverse conditions. The various double density adapters were installed sequentially in the expansion interface.
The test consisted of formatting 40 tracks on the diskette and writing a 6DB6 data pattern on all tracks. The 6DB6 pattern was chosen because it is recommended as a "worst case" test by manufacturers of drives and diskettes. An attempt was then made to read each sector on the disk once - no retrys. Operating system was Newdos/80, Version 1.0, with Double Zap, Version 2.0. Unreadable sectors were totalled and recorded. The test was run ten times with each double density controller and the data averaged. Test results are shown in the table.

★ Features

TRS80 Model I owners who are ready for reliable double density operation will get (1) 80% more storage per diskette, (2) single and double density data separation with far fewer disk I/O errors, (3) single density compatibility and (4) simple plug-in installation. Compatible with all existing double density software.

★ Value

$149.95 for the BEST double density controller on the market.

$189.95 for "DDC" complete with DOSPLUS 3.3D

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★ TEST RESULTS ★

MFR & PRODUCT	SECTORS LOCKED OUT (AVG)
AEROCOMP "DDC"	0
PERCOM "DOUBLER II"	18
PERCOM "DOUBLER A"	250
LNW "LNDOUBLER"	202

Note: test results available upon written request. All tests conducted prior to 8-25-81

Aerocomp's 14 day money back guarantee applies to hardware only.
Specials will be prorated. Shipping $2.00 in Cont. US. See opposite page for details.

Data Separators

The advances that make the "DDC" great are incorporated in the new AEROCOMP Single Density Data Separator ("SDS") and Double Density Data Separator ("DDS").

★ Has your original manufacturer left you holding the bag?

If you already own a Percom "Doubler A", "Doubler II" or LNW "LNDoubler", the AEROCOMP "DDS" will make it right. Look at the test results:

MFR. & PRODUCT	SECTORS LOCKED OUT	
	WITHOUT "DDS"	WITH "DDS"
PERCOM "DOUBLER II"	18	1
PERCOM "DOUBLER A"	250	0
LNW "LNDOUBLER"	202	0

Note: Same test procedures as "DDC".
* Trademark of Percom Data Co.
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★ "DDS" $49.95
(Use 1791 chip from your DD controller)

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Plugs directly into your existing Double Density Controller.

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See opposite page ▸▸▸▸▸▸

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LOAD 80

Tabulate and average survey results.

Questions, Questions, Questions

Jerry Rutledge
Box 123
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Many businesses use questionnaires to poll their salesmen, dealers, customers, agents or the general public to determine preferences, likes, dislikes or opinions on products or services. Usually, these questionnaires are in a multiple-choice format so the answers can be compiled easily with a computer.

The insurance company I work for sends out an annual "President's Questionnaire" to all 600-plus agents in Minnesota. It consists of a two-sided 14-inch sheet containing 50 to 75 questions, asking the agent to rate various company services and departments on a scale of excellent, good, average, below average and poor. As the returns come back by mail, the answers are fed into the TRS-80—an excellent response being input as a one and a poor response being input as a five. If there is no answer, the input is a six.

When the program prints out the results, it assigns values to the responses—from five points for an excellent to one for a poor. A "no answer" is excluded from the calculation. Then the program adds up all the points, divides by the number of valid answers and gives you an average rating for a question.

Without a Perfect Keypuncher

The program was written two years ago and worked fine in its initial form except for one major weakness. The first year, we had 65 questions. This meant setting up a large multiple-element array—A(65,6)—for the responses. That is nearly 400 elements! The answers were input using a For...Next loop, the INKEY$ function and a PRINT@512 to show the operator the question number. If you initialize the program but push Break before you input any answers, you can see how it works. Now, using command mode, type the program:

```
FOR X = 1 to 6:PRINT A(1,X);:NEXT X
```

There are no answers yet, so go back and run the program again. This time pretend you have one response to the first question, an excellent. Enter one as the input for question one and press Break. Now, retype the command program again and Enter:

1 0 0 0 0 0

As you can see, the computer has incremented element A(1,1) by one, storing the fact.

So, what is the big weakness? Simple—once you have keyed in a response it is wiped from the screen forever and loaded into your array where it cannot be changed. Show me someone who can load 19,500 entries (300 responses times 65 questions) into a keyboard without an error. Every time I made a mistake, I swore I would rewrite the program the next morning.

Two years later, I finally got mad enough to act. It seemed I needed two things—the ability to verify the input on the screen and a second array to store that input until it was verified, corrected and dumped into the main array. Then the second array would have to be zeroed out for another set of answers. What a lot of monkey business!

But then I thought: Couldn't I kill two birds with one stone? Doesn't the video screen have memory locations? Couldn't I avoid wasting memory on the second array by picking 65 locations and POKEing my

Program Listing 1

```
1 REM *QUESTION* A PROGRAM TO COMPILE THE RESULTS OF QUESTIONNAI
RES
5 REM BY JERRY RUTLEDGE, BOX 123, WASECA, MN. 56093
10 CLS:DIM A(10,6):CLEAR 300:DU$="##.##"
20 LINE INPUT"TYPE IN TODAY'S DATE (MM/DD/YY) ";T$:X$="#.##"
30 PRINT"IS THERE PREVIOUS DATA STORED ON DISK (Y/N)?";:INPUTD$
40 IF LEFT$(D$,1)="Y"GOSUB1000:GOTO50
45 IF LEFT$(D$,1)<>"N" GOTO 30
50 PRINT"DO YOU WANT TO ADD DATA (Y/N)?";:INPUTZ$:IFLEFT$(Z$,1)=
"N"GOTO100
55 IF LEFT$(Z$,1)<>"Y" THEN 50
60 CLS:GOSUB 10000
100 PRINT"TURN ON PRINTER AND ROLL PAPER DOWN TO FIRST LARGE WHI
TE LINE"
110 INPUT"WHEN READY, PUSH ENTER...";Z$
120 LPRINTTAB(10)"1981 president's questionnaire";TAB(63)"cOMPIL
```

Program Listing 1 continues

The Key Box

Level I Disk Basic
Model I or III
32K RAM
TRSDOS

answers into them? Then, after verifying the input, couldn't I PEEK it into my first array?

The Solution

My solution (Program Listing 1) has been scaled down to handle 10 questions but can be modified easily to deal with more. If you have more than 30 questions, you may want to use two screens of 20 questions each.

Answers from each session of inputting are stored in a sequential disk file called Datafile. When you run the program, you are asked if you wish to add data. If yes, the screen will be formatted for you to POKE and PEEK your answers. It also keeps track of how many questionnaires you have handled during the sitting. If you answer no, the program prepares for you a printout of everything contained in your main array.

When you add data, you may store your array before you print it. I am a skeptic at heart and always use this option. There is nothing worse than having a system hang-up and having to re-input 89 questionnaires. You may also make as many backups of the data disk as you want (another feature for pessimistic hedgers like myself).

About POKEing the Video Memory

There are some things you should understand about POKEing video memory. Look at lines 10010-10030. Line 10010 sets up the mechanics of the video locations POKEd, starting with location 15496. Line 10020 POKEs a question mark on the screen as a prompt for you. It asks you to INKEY$ A$.

Remembering INKEY$ is a string function, we must convert A$ to a numeric value (A = VAL(A$)) in order to be certain our answer lies between one and six in line 10030. Now comes the tricky part. Do we POKE 15496,1? If we do, we will have POKEd the control character for a Break into 15496! No, we must POKE in the ASCII character code for number one—POKE 15496,49 (see Appendix 8-15 in your DOS manual).

Now, how are we going to convert one to 49? Easy. ASC(A$) does it for us. So, POKE X,ASC(A$). Voila!

When you finish inputting and correcting, lines 10060-10066 PEEK X. But we do not want a value for element A(1,49); we want to increment A(1,1). So what we want is CHR$(PEEK(X)). And since that will be returned as a string, we must say Z$ = CHR$(PEEK(X)), and then we must convert Z$ back to a numeric variable—Z = VAL(Z$). Now we have Z being equal to one and in line 10066 we increment element A(1,Z) by one.

Meanwhile in lines 10080 and 10090, the computer is told there are more questionnaires to complete. It clears the correction array's video memory locations by POKEing blanks into them, thus preparing the array for the next set of answers.

Program Listing 1 continued

```
ED ";T$
130 LPRINT:LPRINT"  tHE RATINGS IN COLUMN 7 REPRESENT THE AVERAG
E OF ALL RESPONSES RECEIVED."
140 LPRINT"vALUES WERE ASSIGNED AS FOLLOWS: eXCELLENT = 5, gOOD
= 4 DOWN TO pOOR = 1."
150 LPRINT"tHUS, A RATING OF 3.27 INDICATES AN OVERALL RESPONSE
OF BETWEEN AVERAGE AND GOOD."
160 LPRINT:LPRINT:LPRINT"how does xyz mutual compare with other
companies in your agency?"
170 LPRINT:GOSUB11000
180 B=0:GOSUB1200:LPRINT"sALES LEADERSHIP, ASSISTANCE & COMMUNIC
ATIONS"
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270 LPRINT:LPRINT"xyz mutual overall company rating = ";:LPRINT
USING X$;TV/10:LPRINT
280 LPRINT"rESPONSES HAVE COME FROM";T+A(10,6);"AGENTS TO DATE."

290 LPRINT"tHIS REPRESENTS A RETURN OF ";:LPRINTUSINGDU$;(T+A(10
,6))/105*100;:LPRINT"% TO DATE":REM ASSUMING 105 AGENTS
300 LPRINT:LPRINTT$
310 PRINT"DO YOU WANT ANOTHER COPY OF THIS PRINTOUT (Y/N)?";:INP
UTZ$
320 IF LEFT$(Z$,1)="Y" THEN CLS:GOTO 100
325 IF LEFT$(Z$,1)<>"N" THEN 310
330 CLS:PRINT"HAVE YOU ADDED DATA WHICH SHOULD NOW BE ADDED TO Y
OUR DATA FILE ON DISK (Y/N)?"
340 INPUTZ$:IF LEFT$(Z$,1)="Y" GOSUB 2000
345 IF LEFT$(Z$,1)<>"N" GOTO 330
350 PRINT"WOULD YOU LIKE ANOTHER PRINTOUT (Y/N)?"
360 INPUTZ$:IF LEFT$(Z$,1)="Y" GOTO 100
365 IF LEFT$(Z$,1)<>"N" GOTO 350
370 PRINT:PRINT"END OF PROGRAM";:PRINTTAB(40)T$:END
1000 OPEN"I",1,"DATAFILE"
1010 FOR B=1TO10
1020   FOR C=1 TO 6
1030   INPUT#1,A(B,C)
1040   NEXT C: NEXT B
1045 CLOSE:RETURN
1100 LPRINTTAB(1)"eXC";TAB(7)"gOOD";TAB(14)"aVG";TAB(20)"bELOW";
TAB(27)"pOOR";TAB(33)"nO aNS";TAB(43)"rATING";TAB(62)"qUESTION":
RETURN
1200 U=0:B=B+1:FOR C=1 TO 6
1210 LPRINTTAB(U) A(B,C);
1220 U=U+7:NEXT C
1230 T=A(B,1)+A(B,2)+A(B,3)+A(B,4)+A(B,5)
1240 AV=(A(B,1)*5)+(A(B,2)*4)+(A(B,3)*3)+(A(B,4)*2)+(A(B,5)*1)
1250 IF T=0 THEN AV=0:GOTO 1280
1260 AV=AV/T
1270 TV=TV+AV
1280 LPRINTTAB(44):LPRINT USING X$;AV;
1290 LPRINTTAB(55):RETURN
2000 CLS:PRINT"DATA BEING TRANSFERRED TO DISK FILE"
2010 OPEN"O",1,"DATAFILE"
2020 FOR B=1 TO 10
2030   FOR C=1 TO 6
2040   PRINT#1, A(B,C)
2050 NEXT C:NEXT B
2060 CLOSE
2070 PRINT:PRINT"COMPLETE DATA STORED ON DISK"
2080 PRINT:PRINT"DO YOU WANT TO COPY YOUR DATA FILES ON ANOTHER
DISK FOR BACKUP?"
2090 INPUTZ$:IF LEFT$(Z$,1)="Y" THEN 2100
2095 IF LEFT$(Z$,1)<>"N" THEN 2080 ELSE RETURN
2100 PRINT"INSERT BACKUP DISK IN DRIVE #1 AND PRESS ENTER WHEN R
EADY TO CONTINUE"
```

Program Listing 1 continues

". . . if you want to echo the capabilities of the TRS-80's bigger brothers. . . see Program Listing 2."

```
2110 INPUTZ$:GOTO2000
10000 T=128:FORX=1TO10:PRINT@T,"(";X")";:T=T+16:NEXT
10004 PRINT@18,"PRESIDENT'S QUESTIONNAIRE";:PRINT@64,STRING$(63,
137);:PRINT@320,STRING$(63,137);
10006 QN=QN+1:PRINT@384,"READY FOR YOUR INPUT";
10008 PRINT@424,"QUESTIONNAIRE NUMBER";QN
10010 FOR X=15496 TO 15653 STEP 16
10020 POKE X,63:A$=INKEY$:IFA$=""THEN10020ELSEA=VAL(A$)
10030 IF A<1ORA>6THEN10020 ELSE POKE X,ASC(A$):NEXT
10040 PRINT@512,"DO YOU WANT TO CHANGE ANY RESPONSES?";:C$=INKEY
$:IFC$=""THEN 10040
10050 IFLEFT$(C$,1)="Y"THEN GOTO15000
10052 IF LEFT$(C$,1)<>"N" THEN 10040
10055 PRINT@384,STRING$(20,32);:PRINT@578,"DATA BEING STORED";:F
ORU=1TO500:NEXTU
10060 Y=1:FOR X=15496 TO 15653 STEP 16
10065 Z$=CHR$(PEEK(X)):Z=VAL(Z$)
10066 A(Y,Z)=A(Y,Z)+1:Y=Y+1:NEXTX
10070 GOSUB 20000
10072 PRINT@512,"ARE THERE MORE QUESTIONNAIRES TO COMPLETE (Y/N)
?";:C$=INKEY$:IFC$=""THEN10072
10073 IF C$="N" THEN GOTO 10200
10075 IF LEFT$(C$,1)<>"Y" GOTO 10072 ELSE GOSUB 20000
10080 FOR X=15496 TO 15653 STEP 16
10090 POKE X,32:NEXT
10100 GOTO 10000
10200 GOSUB 20000:PRINT@512,"FOR SAFETYS SAKE, DO YOU WANT TO ST
ORE THIS DATA ON DISK BEFORE PRINTING?"
10210 INPUT Z$:IF LEFT$(Z$,1)="Y" THEN GOSUB 2000
10212 IF LEFT$(Z$,1)<>"N" THEN 10210
10220 RETURN
```

Program Listing 1 continues

A Fancier Format

The program in Listing 1 is easy to use, but its real strength is it's simple to modify. To add questions, change the For. . . Next loops to include more memory. You must also move your PRINT@ statements down the screen out of the way of your additional questions, redimension your array and increase your PRINT# and INPUT# statements.

But if you want to echo the capabilities of the TRS-80's bigger brothers—IBM and UNIVAC—see Program Listing 2. It will put a border around your questions and also box each one. You will be amazed at the class this will add to your screen.

Listing 2 starts at line 10000, so if you copied Listing 1, delete everything beyond that line and add Listing 2.

However, it is more difficult to add questions to Listing 2 than Listing 1. Each line of graphics takes an additional line of memory. You must do some calculating to determine where your next line of answers will be. It will become easy after you study the program and see the pattern develop from one line to the next. ■

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Program continued

```
15000 PRINT@512,"WHAT QUESTION DO YOU WANT TO CHANGE?";:INPUTCH
15005 CH=CH-1
15010 X=15496+(CH*16):POKE X,32
15020 PRINT@578,"GIVE ME CORRECT ANSWER";:A$=INKEY$:IFA$=""THEN1
5020ELSEA=VAL(A$)
15030 IFA<1ORA>6THEN15020ELSEPOKE X,ASC(A$)
15040 GOSUB20000:GOTO10040
20000 PRINT@512,STRING$(63,32);
20010 PRINT@578,STRING$(63,32);
20020 RETURN
```

Program Listing 2

```
10 CLS:DIM A(10,6):CLEAR 300:DU$="##.##"
20 LINE INPUT"TYPE IN TODAY'S DATE (MM/DD/YY) ";T$:X$="#.##"
30 PRINT"IS THERE PREVIOUS DATA STORED ON DISK (Y/N)?";:INPUTD$
40 IF LEFT$(D$,1)="Y"GOSUB1000:GOTO50
45 IF LEFT$(D$,1)<>"N" GOTO30
50 PRINT"DO YOU WANT TO ADD DATA (Y/N)?";:INPUTZ$:IFLEFT$(Z$,1)=
"N"GOTO100
55 IF LEFT$(Z$,1)<>"Y" THEN 50
60 CLS:GOSUB 10000
100 PRINT"TURN ON PRINTER AND ROLL PAPER DOWN TO FIRST LARGE WHI
TE LINE"
110 INPUT"WHEN READY, PUSH ENTER...";Z$
120 LPRINTTAB(10)"1981 president's questionnaire";TAB(60)"cOMPIL
ED ";T$
130 LPRINT:LPRINT"  tHE RATINGS IN COLUMN 7 REPRESENT THE AVERAG
E OF ALL RESPONSES RECEIVED."
140 LPRINT"vALUES WERE ASSIGNED AS FOLLOWS: eXCELLENT = 5, gOOD
= 4 DOWN TO pOOR = 1."
150 LPRINT"tHUS, A RATING OF 3.27 INDICATES AN OVERALL RESPONSE
OF BETWEEN AVERAGE AND GOOD."
160 LPRINT:LPRINT:LPRINT"how does xyz mutual compare with other
companies in your agency?"
170 LPRINT:GOSUB1100
180 B=0:GOSUB1200:LPRINT"sALES LEADERSHIP, ASSISTANCE & COMMUNIC
ATIONS"
190 GOSUB1200:LPRINT"pOLICY PREPARATION, CHANGES AND RENEWALS"
200 GOSUB 1200:LPRINT"aCCOUNTING, BILLING AND RELATED SERVICES"
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L WITH"
245 GOSUB1200:LPRINT"rATE mANUAL - READABILITY & UNDERSTANDABILI
TY"
250 GOSUB 1200:LPRINT"oVERALL COMMISSION/pROFIT sHARING SCHEDULE
"
260 GOSUB 1200:LPRINT"cOMPETITIVENESS OF OVERALL PRICING"
270 LPRINT:LPRINT"xyz mutual overall company rating = ";:LPRINT
USING X$;TV/10:LPRINT
280 LPRINT"rESPONSES HAVE COME FROM";T+A(10,6);"AGENTS TO DATE."

290 LPRINT"tHIS REPRESENTS A RETURN OF ";:LPRINTUSINGDU$;(T+A(10
,6))/105*100;:LPRINT"% TO DATE":REM ASSUMING 105 AGENTS
300 LPRINT:LPRINTT$
310 PRINT"DO YOU WANT ANOTHER COPY OF THIS PRINTOUT?";:INPUTZ$
320 IF LEFT$(Z$,1)="Y" THEN CLS:GOTO 100
330 CLS:PRINT"HAVE YOU ADDED DATA WHICH SHOULD NOW BE ADDED TO Y
OUR DATA FILE ON DISK?"
340 INPUTZ$:IF LEFT$(Z$,1)="Y" GOSUB 2000
345 IF LEFT$(Z$,1)<>"N" GOTO 330
350 PRINT"WOULD YOU LIKE ANOTHER PRINTOUT (Y/N)?"
360 INPUTZ$:IF LEFT$(Z$,1)="Y" GOTO 100
365 IF LEFT$(Z$,1)<>"N" GOTO 350
370 PRINT:PRINT"END OF PROGRAM";:PRINTTAB(40)T$:END
1000 OPEN"I",1,"DATAFILE"
1010 FOR B=1TO10
1020    FOR C=1 TO 6
1030    INPUT#1,A(B,C)
1040    NEXT C: NEXT B
1045 CLOSE:RETURN
1100 LPRINTTAB(1)"eXC";TAB(7)"gOOD";TAB(14)"aVG";TAB(20)"bELOW";
TAB(27)"pOOR";TAB(33)"nO aNS";TAB(43)"rATING";TAB(62)"qUESTION":
RETURN
1200 U=0:B=B+1:FOR C=1 TO 6
1210 LPRINTTAB(U) A(B,C);
1220 U=U+7:NEXT C
1230 T=A(B,1)+A(B,2)+A(B,3)+A(B,4)+A(B,5)
1240 AV=(A(B,1)*5)+(A(B,2)*4)+(A(B,3)*3)+(A(B,4)*2)+(A(B,5)*1)
1250 IF T=0 THEN AV=0:GOTO 1280
```

Program Listing 2 continues

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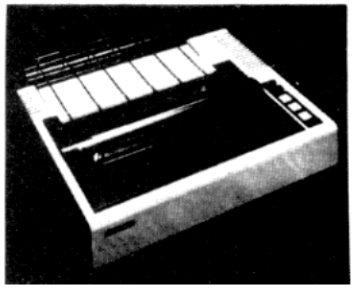

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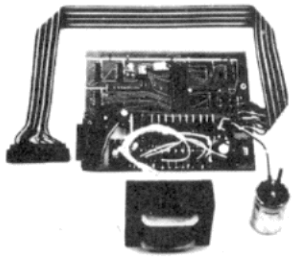

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Program Listing 2 continued

```
1260 AV=AV/T
1270 TV=TV+AV
1280 LPRINTTAB(44):LPRINT USING X$;AV;
1290 LPRINTTAB(55):RETURN
2000 CLS:PRINT"DATA BEING TRANSFERRED TO DISK FILE"
2010 OPEN"O",1,"DATAFILE"
2020 FOR B=1 TO 10
2030   FOR C=1 TO 6
2040   PRINT#1, A(B,C)
2050 NEXT C:NEXT B
2060 CLOSE
2070 PRINT:PRINT"COMPLETE DATA STORED ON DISK"
2080 PRINT:PRINT"DO YOU WANT TO COPY YOUR DATA FILES ON ANOTHER
DISK FOR BACKUP?"
2090 INPUTZ$:IF LEFT$(Z$,1)="Y" THEN 2100 ELSE RETURN
2100 PRINT"INSERT BACKUP DISK IN DRIVE #1 AND PRESS ENTER WHEN R
EADY TO CONTINUE"
2110 INPUTZ$:GOTO2000
10000 GOSUB12000
10001 T=129:FORX=1TO4:Z$=CHR$(40)+RIGHT$(STR$(X),1)+CHR$(41):PRI
NT@T,Z$;:T=T+16:NEXT
10002 T=257:FORX=5TO8:Z$=CHR$(40)+RIGHT$(STR$(X),1)+")":PRINT@T,
Z$;:T=T+16:NEXT
10003 T=385:PRINT@T,"(9)";:T=T+16:PRINT@T,"(10)";
10006 QN=QN+1:PRINT@512,"READY FOR YOUR INPUT";
10008 PRINT@552,"QUESTIONNAIRE NUMBER";QN
10009 SU=15496:Y=15544:FOR R=1TO3
10010 FOR X=SUTOY STEP 16
10012 IF X>15768 THEN 10040
10020 POKE X,63:A$=INKEY$:IFA$=""THEN10020ELSEA=VAL(A$)
10030 IF A<1ORA>6THEN10020 ELSE POKE X,ASC(A$):NEXTX
10032 SU=SU+128:Y=Y+128:NEXTR
10040 PRINT@640,"DO YOU WANT TO CHANGE ANY RESPONSES?";:C$=INKEY
$:IFC$=""THEN 10040
10050 IFLEFT$(C$,1)="Y"THEN GOTO15000
10052 IF LEFT$(C$,1)<>"N" THEN 10040
10055 PRINT@512,STRING$(20,32);:PRINT@706,"DATA BEING STORED";:F
ORU=1TO500:NEXTU
10060 Y=1:FOR X=15496 TO 15544 STEP 16:GOSUB11000:NEXTX
10062 FOR X=15624 TO 15672 STEP 16:GOSUB11000:NEXTX
10064 FOR X=15752 TO 15768 STEP 16:GOSUB11000:NEXTX
10070 GOSUB 20000
10072 PRINT@640,"ARE THERE MORE QUESTIONNAIRES TO COMPLETE (Y/N)
?";:C$=INKEY$:IFC$=""THEN10072
10073 IF C$="N" THEN GOTO 10200
10074 IFLEFT$(C$,1)<>"Y" THEN 10072 ELSE GOSUB 20000
10075 SU=15496:Y=15544:FORR=1TO3
10080 FOR X=SU TO Y STEP 16
10082 IF X>15768 THEN 10100 ELSE POKE X,32:NEXT X
10084 SU=SU+128:Y=Y+128:NEXT R
10100 GOTO 10001
10200 GOSUB 20000:PRINT@640,"FOR SAFETYS SAKE, DO YOU WANT TO ST
ORE THIS DATA ON DISK BEFORE PRINTING?"
10210 INPUT Z$:IF LEFT$(Z$,1)="Y" THEN GOSUB 2000 ELSE RETURN
10220 RETURN
11000 Z$=CHR$(PEEK(X)):Z=VAL(Z$)
11010 A(Y,Z)=A(Y,Z)+1:Y=Y+1:RETURN
12000 REM
12005 PRINT@56,T$;
12010 PRINT@18,"PRESIDENT'S QUESTIONNAIRE";:PRINT@64,STRING$(64,
140);
12020 FOR X=64TO127 STEP 16:PRINT@X,CHR$(156);:NEXT:PRINT@127,CH
R$(172);
12030 Y=128:Z=191:GOSUB12100
12040 Y=192:Z=255:GOSUB 12110
12050 Y=256:Z=319:GOSUB12100
12060 Y=320:Z=383:GOSUB12110
12070 Y=384:Z=447:GOSUB12100
12080 PRINT@448,STRING$(64,140);:FORX=448TO 511 STEP 16:PRINT@X,
CHR$(141);:NEXT:PRINT@511,CHR$(142);
12090 RETURN
12100 FOR X=Y TO Z STEP 16:PRINT@X,CHR$(149);:NEXT:PRINT@Z,CHR$(
170);:RETURN
12110 PRINT@Y,STRING$(64,140);:FOR X=Y TO Z STEP 16:PRINT@X,CHR$
(157);:NEXT:PRINT@z,CHR$(174);:RETURN
15000 PRINT@640,"WHAT QUESTION DO YOU WANT TO CHANGE?";:INPUTCH:
IFCH>10THEN15000ELSEIFCH>4GOTO15004
15001 CH=CH-1:X=15496+(CH*16):POKEX,32:GOTO15020
15004 IFCH>8GOTO15010
15005 CH=CH-1:X=15560+(CH*16):POKEX,32:GOTO15020
15010 CH=CH-1:X=15624+(CH*16):POKEX,32:GOTO15020
15020 PRINT@706,"GIVE ME CORRECT ANSWER";:A$=INKEY$:IFA$=""THEN1
5020ELSEA=VAL(A$)
15030 IFA<1ORA>6THEN15020ELSEPOKE X,ASC(A$)
15040 GOSUB20000:GOTO10040
20000 PRINT@640,STRING$(63,32);
20010 PRINT@706,STRING$(63,32);
20020 RETURN
```

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The Spanning of Model II Disks

Dan Keen and Dave Dischert
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Many business applications require that a file contain more data than can fit on one drive. We will discuss some ideas for hooking together files on external drives while keeping search time to a minimum. We will deal with the type of program that creates two files, where a record in one file has a record or records in another file that also contains relevant information.

Such a program must be structured around the following parameters:

- The program must have some way of keeping track of the next record number to be written into in the main file.
- The files that are to be linked are called satellite files, because they are on the external drives and contain information that relates to a record in the main file. They must have identical fielding except for subscripts, which will determine the buffer and drive to receive the data.
- All satellite files are opened and fielded at the same time.
- Both the main files and the satellite files will contain record numbers to point to the location of associated records.

```
0 ' MINI PROPERTY RENTAL TRACKER PROGRAM
    TO DEMONSTRATE LINKING INFORMATION IN MORE THAN ONE
    FILE ON MORE THAN ONE DRIVE

10 OPEN"D",4,"PROP/ID:0",115:DIM PI$(20)
20 FIELD4,20AS PI$(0),20AS PI$(1),5AS PI$(2),5AS PI$(3),5AS PI$(4),5AS PI$(5),5AS PI$(6),5AS PI$(7),5AS PI$(8),5AS PI$(9),5AS PI$(10
),5AS PI$(11),5AS PI$(12),5AS PI$(13),5AS PI$(14),5AS PI$(15),5AS PI$(16)
30 OPEN"D",1,"TENANT1/FIL:1",40:FIELD1,20AS NA$(1),20AS DA$(1),10AS RE$(1)
40 OPEN"D",2,"TENANT2/FIL:2",40:FIELD2,20AS NA$(2),20AS DA$(2),10AS RE$(2)
50 OPEN"D",3,"TENANT3/FIL:3",40:FIELD3,20AS NA$(3),20AS DA$(3),10AS RE$(3)
60 '
    MENU

70 PRINT"CROOD A PROPERTY TO THE LIST"
80 PRINT"CT>ENANT (ADD)"
90 INPUTZ$:IFZ$="T"THEN200
100 '
     ADD A NEW PROPERTY TO THE FILE

110 R%=LOF(4)+1 ' DETERMINES THE RECORD # TO PUT THIS PROPERTY
120 INPUT"ENTER PROPERTY ADDRESS";A$
130 INPUT"ENTER OWNER'S NAME";B$
140 ' HERE YOU COULD ENTER MORE PROPERTY CHARACTERISTICS
150 LSET PI$(0)=A$:LSET PI$(1)=B$
160 FOR%=2TO16:LSET PI$(X)=STRING$(5,"*"):NEXT
170 PUT4,R%:GOTO60
200 '
     ADD A TENANT TO THE FILE

210 INPUT"ENTER THE PROPERTY ADDRESS WHERE THIS GUY WILL STAY";A$
220 FOR%=1TOLOF(4):GET4,R%  ' SEARCH FOR MATCH IN PROP/ID FILE
230 IFA$=LEFT$(PI$(0),LEN(A$))THEN300
240 NEXT:PRINT"PROPERTY NOT FOUND":END
300 ' FOUND THE PROPERTY IN RECORD # R%
310 INPUT"ENTER THE TENANT'S NAME";A$
320 INPUT"ENTER THE DATE OF THE WEEK HE RENTS";B$
330 ' DETERMINE DRIVE & BUFFER NUMBERS NEXT
340 IFR%<=250 THEN DR=1
350 IFR%>250 AND R%<=1500 THEN DR=2 ELSE DR=3
360 LSET NA$(DR)=A$:LSET DA$(DR)=B$:LSET RE$(DR)=STR$(R%)
370 TF%=LOF(DR)+1 ' TELLS US WHERE TO STORE TENANT IN TENANT/FIL
380 PUT,DR),TF%
390 ' NOW STORE TF% BACK WITH THE PROPERTY ID RECORD
400 FOR%=2TO16 ' SEARCH FOR OPEN SPOT TO TAG VALUE OF TL%
410 IF LEFT$(PI$(X),1)<>"*"THEN NEXT ELSE 430
420 PRINT"SORRY, OUT OF FILE SPACE FOR THIS PROPERTY":END
430 GET4,R%:LSET PI$(X)=STR$(TF%):PUT4,R%:GOTO60
```

Program Listing 1

A Sample Program

The technique is easier to understand if we set up a hypothetical program and discuss each step in its operation. Let's choose a situation which has a practical application. Program Listing 1 keeps a list of rental properties and their characteristics along with the names and addresses of tenants.

Two files are created, a main one to store the properties' profiles, such as the owner's name, location, listing salesman, number of bedrooms and baths, etc. For the sake of simplicity, we will only show the Property/ID file as containing several of these items.

A second set of files, Tenants/File, stores the tenant names, the dates they are reserving, and a number to tell it which record in the Prop/ID file holds the associated property data. Let's say that this program is designed for real estate at the seashore, where properties are rented for not less than a week and the season lasts 15 weeks.

A tenant record is 40 bytes long, consisting of 20 characters for the tenant name, 10 for the occupancy date, and 10 for the rec-

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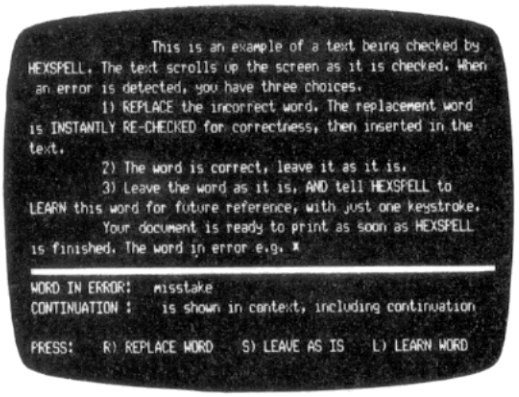

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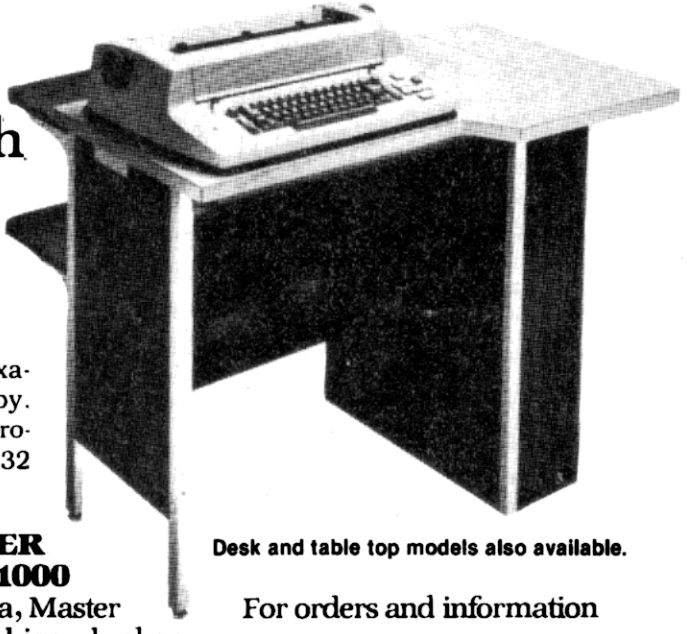

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"All satellite files are open and fielded at the same time."

ord number in the appropriate Prop/ID file. We know there is enough room on drive zero for DOS, our program, and the Prop/ID file. The external drives will store the Tenant/Files.

A formatted non-system diskette contains 480,000 bytes. Since a tenant record is 40 bytes, we can get 12,000 records on an external diskette (480,000 divided by 40). That will handle the rental information for 800 properties (12,000/15 weeks). If we use two external drives, the system accommodates 1600 properties, and a complete expansion unit handles 2400. Use a value just less than the maximum number of records to ensure there is plenty of room, such as 790 and 1580 in contrast to 800 and 1600.

"This Basic program structure can be expanded to make a very nice rental system."

We must have a method for keeping track of the next record to be written into in the Prop/ID file. Many ways are available, but we simply use LOF(4) + 1.

All functions associated with the satellite files, such as buffers, field variables, and Put statements, must use the variable DR, the drive number, in their statements. Open all files at once. The value of DR will determine which drive stores the tenant. We know how many records will fit on each of the tenant file disks. With a simple test of the value of RZ, the buffer and drive can be established (see lines 340 and 350 in Program Listing 1).

At the time a record is created for a property, 15 variables are set aside. These store the record numbers pointing to tenant information in the tenant files. It is easy and fast to get tenant records once you have the property record. The record number of the property tells you what drive the tenant records are on by checking the value of RZ and PI$(2) through PI$(16) point to each record exactly.

If you are cramped for space, reserve only two bytes for storage of each record number instead of five, and use MKI$. At the time of adding a property, asterisks are LSET into those 15 fielded areas. Then, when a tenant is added a matching routine will search through PI$(X), and when it finds an asterisk it knows that space is available for storing the tenant record number.

Now we have numbers in both files to indicate where the other data is located. You still need a search routine to get either the property ID record or the tenant info, but once you have one, you instantly know where to go to get the other, thus making retrieving all data fairly fast. Program Listing 2 shows a sample search module which could be added to Listing 1. It locates property in the Prop/ID file by the operator entering a tenant's name. Of course, we can search the other way too. That is, by knowing the property address or perhaps just the owner's name, a scan can be done to get each tenant record.

Summary

To recap, Program Listing 1 can be described in a nutshell:

- All files are opened and fielded simultaneously.
- Add a property and its characteristics by storing it as a record in the Prop/ID file.
- At the same time, fill the rest of the record with asterisks. This area will be used to store the record number locations in the tenant files, because, as tenants are added, a search can be done on these spaces to look for available spots for LSetting.
- When a tenant is added, the property address record is gotten and put in buffer 4.
- The tenant and his associated information is entered from the keyboard and stored in a tenant file. The file and drive that stores it is determined by the record number of the property. This is based on figures regarding the total number of tenant records allotted to each diskette.

This Basic program structure can be expanded to make a very nice rental system. Indeed, we did just that for a local firm. We intend to use these concepts when writing other types of programs on our multi-drive Model II computer. ■

```
500 ' SEARCH ROUTINE  -  ASSUMES FILES ARE OPEN

510 INPUT"ENTER TENANT NAME";A$
520 FOR X=1 TO LOF(1) GET1,X
530 IFA$=LEFT$(NA$(1),LEN(A$))THEN600
540 NEXT FOR X=1 TO LOF(2) GET2,X
550 IFA$=LEFT$(NA$(2),LEN(A$))THEN600
560 NEXT FOR X=1 TO LOF(3) GET3,X
570 IFA$=LEFT$(NA$(3),LEN(A$))THEN600
580 NEXT PRINT"TENANT NOT IN FILES" END
600 'FOUND NAME - NOW TO GET PROPERTY RECORD
610 RZ=VAL(RE$)
620 GET4,RZ
630 PRINT"THIS TENANT WILL BE STAYING AT THE PROPERTY ADDRESS ";PI$(8)
```

Program Listing 2

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home applications

Program Listing

```
10 REM  RADIO CAR CONTROL
20 REM  INSERT COMMAND STRING IN LINE 100 (<256 CHAR)
30 REM  0=STRAIGHT
40 REM  1=LEFT TURN
50 REM  2=RIGHT TURN
60 REM  >2=END
70 REM  ADJUST DURATION OF COMMAND IN LINE 160
80 REM
90 REM
99 REM
100 A$="000000011111000000222222222222200000000000011111000003"
110 N=1:CLS
120 WHILE@(X+128,Y+20
130 IF VAL(A$,N,1)
```

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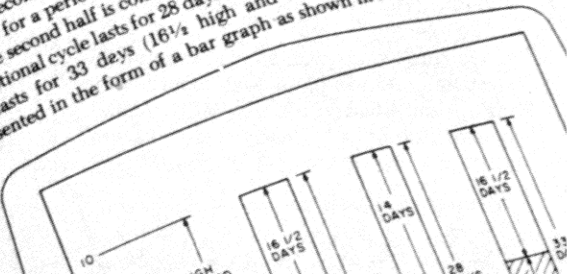

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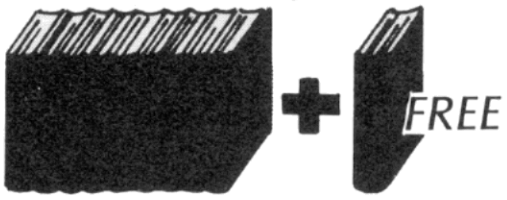

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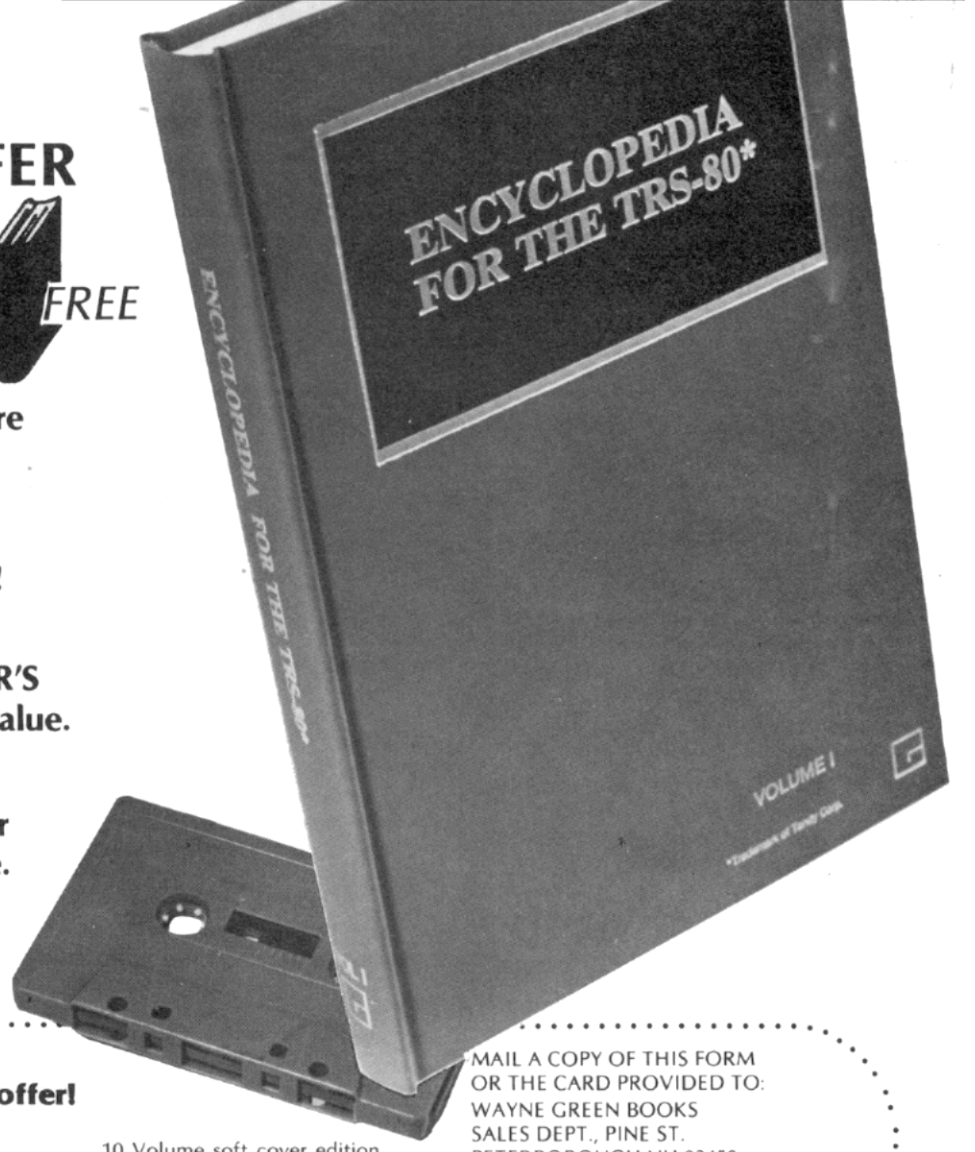

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$$\text{Monthly payment} = \frac{\text{Interest}*\text{years}*\text{Loan} + \text{Loan}}{12*\text{years}}$$

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$$\text{Monthly payment} = \frac{.06*2*5000 + 5000}{12*2}$$

$$\text{Monthly payment} = 233.33$$

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A number of approximation equations have been developed for the purpose of determining the APR associated with some add-on interest situations. These equations may be found in the calculator books which come with some calculators. No equation gives an exact answer except the one given below. The problem with this equation is that you must solve it by trial and error. There is no way to solve it directly.

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Month	Interest	Reduction	Balance	Interest	Reduction	Balance	Diff.
1	48.00	185.33	4814.67	46.50	186.83	4813.17	-1.50
2	46.00	187.33	4627.34	44.76	188.57	4624.60	-2.74
3	44.00	189.33	4438.01	43.01	190.32	4434.28	-3.73
4	42.00	191.33	4246.68	41.24	192.09	4242.19	-4.49
5	40.00	193.33	4053.35	39.45	193.88	4048.31	-5.04
6	38.00	195.33	3858.02	37.65	195.68	3852.63	-5.39
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8	34.00	199.33	3461.36	33.99	199.34	3455.79	-5.57
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10	30.00	203.33	3056.70	30.27	203.06	3051.54	-5.16
11	28.00	205.33	2851.37	28.38	204.95	2846.59	-4.78
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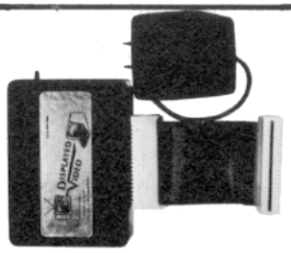
13	24.00	209.33	2434.71	24.55	208.78	2430.95	-3.76
14	22.00	211.33	2223.38	22.61	210.72	2220.23	-3.15
15	20.00	213.33	2010.05	20.65	212.68	2007.55	-2.50
16	18.00	215.33	1794.72	18.67	214.66	1792.89	-1.83
17	16.00	217.33	1577.39	16.67	216.66	1576.23	-1.16
18	14.00	219.33	1358.06	14.66	218.67	1357.56	-0.50
19	12.00	221.33	1136.73	12.63	220.70	1136.86	0.13
20	10.00	223.33	913.40	10.57	222.76	914.10	0.70
21	8.00	225.33	688.07	8.50	224.83	689.27	1.20
22	6.00	227.33	460.74	6.41	226.92	462.35	1.61
23	4.00	229.33	231.41	4.30	229.03	233.32	1.91
24	2.00	231.33	0.00	2.17	233.32	0.00	0.00

Table 1. Sample run.



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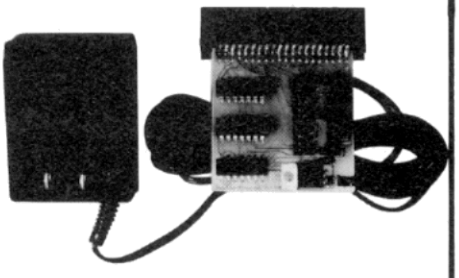

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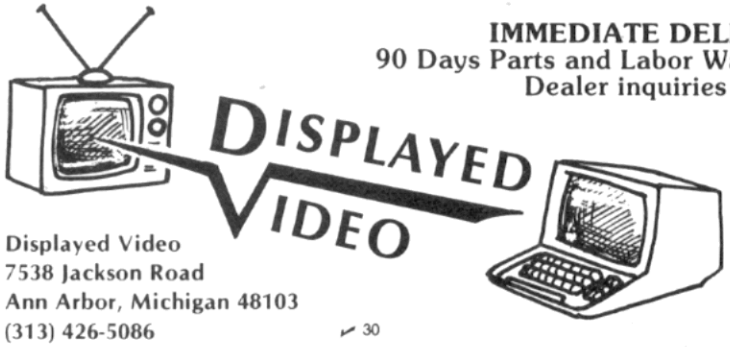

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it is possible to calculate a standard amortization table. Our program performs this task.

The Rule of 78 is an alternative method to determine the sum of money needed to pay off a loan. The program has been designed to do this task. The Rule of 78 assumes N/sum of the digits * the interest expense ($600) is reduced the first period, (N-1)/sum of the digits * the interest expense is reduced the second period, etc., where N is the number of periods over which the loan runs.

The program then compares the results of the two approaches. In general, the amount needed to pay off a loan using the Rule of 78 will be greater than when using the normal amortization approach. This is illustrated in our sample run. Under specific circumstances lenders may use the Rule of 78 to determine the amount needed to pay off a loan. In Alabama the Rule of 78 is usually used by those making auto loans, and in other installment loans. Regulation Z of the federal government controls the application of the Rule of 78.

```
10 CLS:P=23:PRINTCHR$(P):PRINT"RULE OF 78 VERSUS AMORTIZATION
     TABLES":PRINT:GOTO60:REM  "RULE78"
20 X=(AP@*(1+AP@)[(YR*12)):PAY=LO*X/((1+AP@)[(12*YR)-1):RETURN
30 X=INT(100*PAY)/100:Y=PAY-X:IPY>.005THENX=X+.01
40 PAY=X:RETURN
50 PRINT"MONTHLY PAYMENT IS:";PAY:RETURN
60 PRINT"   STEVEN M. ZIMMERMAN,Ph.D.   & LEO M. CONRAD":PRINT"
   1981"
70 PRINT:PRINT:INPUT"LOAN";LO:INPUT"NUMBER OF YEARS";YR
80 PRINT:PRINT"MENU":PRINT"    ADD   ADD ON INTEREST"
90 PRINT"    APR   ANNUAL PERCENTAGE RATE"
100 INPUTA$:IFA$="APR" THEN 160
110 IFA$<>"ADD"THEN80
120 INPUT"ADD ON INTEREST RATE";AD:AD=AD*.01
130 PAY=(YR*AD*LO+LO)/(12*YR):GOSUB30:GOSUB50:XP=PAY
140 FORI=1TO999:AP@=.0001*I+AD/12:GOSUB20:GOSUB30:IFPAY>=XPTHEN1
90
150 NEXTI:PRINT"ERROR":END
160 INPUT"ANNUAL PERCENTAGE RATE";AP@:AP@=AP@*.01/12
170 GOSUB20:GOSUB30:XP=PAY
180 ADD=(12*YR*PAY-LO)/(LO*YR)
190 INPUT"HARD COPY (Y/N)";Y$:CLS:PRINT"LOAN";LO:PRINT"ADD ON IN
TEREST:";100*ADD;"%":IFY$="Y"THENLPRINT"LOAN ";LO:LPRINT"ADD ON
INTEREST:";100*ADD;"%"
200 PRINT"PAYMENT ";XP:IFY$="Y"LPRINT"PAYMENT ";XP
210 PRINT"ANNUAL PERCENTAGE RATE:"1200*AP@;"%":IFY$="Y"THENLPRIN
T"ANNUAL PERCENTAGE RATE:";1200*AP@;"%"
220 INPUT"ENTER TO CONTINUE";D$
230 A$="          RULE 78              REGULAR AMORTIZATION":PRINTA$:I
FY$="Y"THEN LPRINT" ";LPRINTA$
240 A$="MONTH ":B$="INTEREST ":D$="REDUCTION BALANCE ":C$="DIFF"

250 PRINTA$;B$;D$;B$;D$;C$:IFY$="Y"THEN LPRINTA$;B$;D$;B$;D$;C$
260 S=0:M=12*YR:FORI=1TOM:S=S+I:NEXTI:RB=LO:LX=LO
270 CC=0:FORI=1TOM:IT=(M-I+1)/S*(YR*AD*LO):RXD=XP-IT:RB=RB-RXD:I
FI=MTHENIX=AP@*LX:RD=LX:LX=0:DD=0:GOTO290
280 IX=AP@*LX:RD=XP-IX:LX=LX-RD:DD=LX-RB
290 A$="### ####.## ####.## ####.## #####.## #####.## #####.## #
####.##":PRINTUSING$;I,IT,RXD,RB,IX,RD,LX,DD:IFY$="Y"THENLPRINT
USING$;I,IT,RXD,RB,IX,RD,LX,DD
300 CC=CC+1:IFCC=13ANDY$<>"Y"THENINPUT"ENTER TO CONTINUE";D$:CC=
0
310 NEXT
```

Program Listing

Running the Program

After the program has been loaded from tape or disk, you start the operation by typing run and hitting Enter.

The example we used at the beginning of this article specified a loan of $5,000. Type 5000 and hit Enter. The program will then ask you how many years. Our example called for a two year loan. Type 2 and hit Enter. Next, the main menu will appear.

Since the add on interest was specified in our example, type Add and hit Enter. The add on interest we specified was six percent. Type 6 and hit Enter and your monthly payment of $233.33 will appear on the screen. After a short delay the computer will ask if you want a printout. The next thing you see will be:

```
LOAN 5000
ADD ON INTEREST 6%
PAYMENT 233.33
ANNUAL PERCENTAGE RATE:
  11.1600000411272 %
ENTER TO CONTINUE?_
```

You may wonder why we carried out the value of the APR to the degree shown above. We did this because a small difference in the APR will produce big variations in the results. If you rerun the program selecting to input the APR and type in the 11.16 you will get a payment of $233.41. This is enough to make a difference in some situations.

Now hit Enter to continue and you will get the results shown in the sample run. The key in this analysis is the difference in the amount needed to pay off a loan under the alternative approaches. In this case it just happens the maximum difference between the two approaches occurs in the eighth month. If you used the Rule of 78 then $3461.36 would be needed to eliminate the loan at that time and only $3488.79 would be needed for the amortization approach. The difference to be paid by the borrower is $5.57. This extra is a small amount on a single loan but can add up to big dollars in extra payments if a large number of loans are involved.

From the finance company's point of view the rate of return earned on their money will be greater if the loan is paid off early. Most borrowers are unaware of this. The Rule of 78 is an alternative method of calculating the dollars necessary to pay off a loan. We have found this approach used for auto loans. The borrower should be aware of the details of the loan agreement he is making so he does not end up paying for his ignorance. This program should help.■

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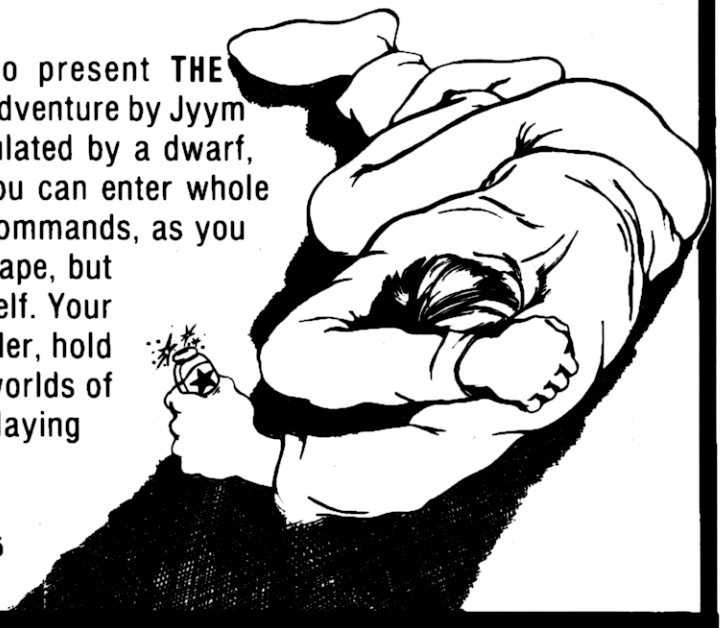

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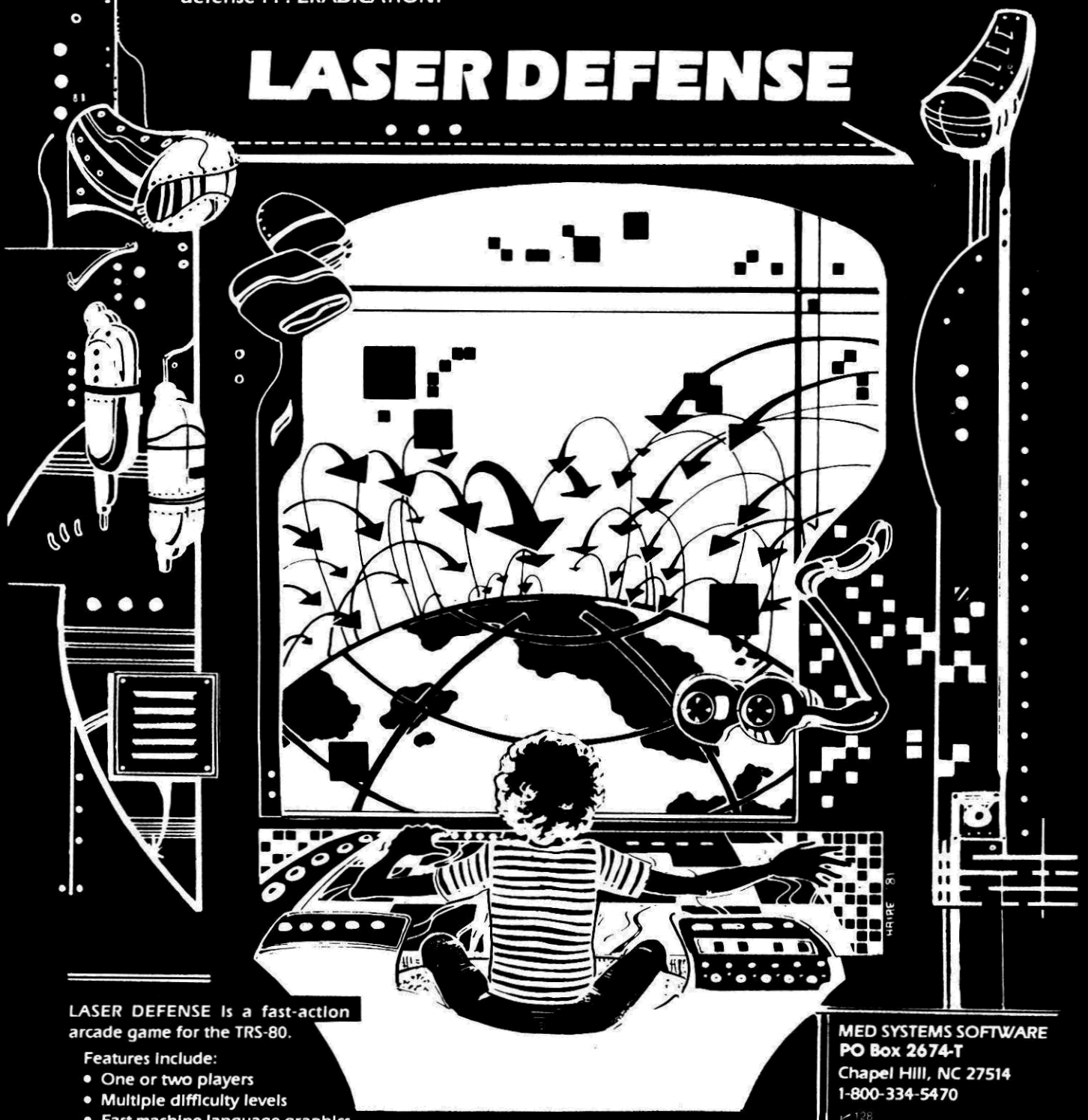

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LPRINT CHR$(1)	Printer Mode
LPRINT CHR$(2)	Plotter Mode
LPRINT CHR$(3)	2 Times Character Size
LPRINT CHR$(4)	4 Times Character Size
LPRINT CHR$(5)	8 Times Character Size
LPRINT CHR$(6)	Return to Smallest Size Character
LPRINT CHR$(8)	Backspace 1 Character
LPRINT CHR$(10)	Linefeed
LPRINT CHR$(13)	Linefeed with Carriage Return
LPRINT CHR$(17)	Normal Print Position
LPRINT CHR$(18)	Print Rotated 90 Degrees Left Read
LPRINT CHR$(19)	Print Rotated 180 Degrees Upside Down
LPRINT CHR$(20)	Print Rotated 270 Degrees Right Read

Fig. 1. Character String Code

All G-Codes are followed by location coordinates.

LPRINT "G00 X0000 Y0000"	Dotted Line
LPRINT "G01 X0000 Y0000"	Solid Line
LPRINT "G02 X0000 Y0000"	Clockwise Arc
LPRINT "G03 X0000 Y0000"	Counter Clockwise Arc
LPRINT "G50 X0000 Y0000"	Lifts Pen and Moves to Point
LPRINT "G90 X0000 Y0000"	Draws Line to X Coordinate, Then to Y Coordinate, Lifts Pen and Returns to Starting Point
LPRINT "G91 X0000 Y0000"	Lifts Pen and Moves to Point, Draws Line to X Coordinate. Then to Y Coordinate, Lifts Pen and Returns to Starting Point

Fig. 2. G Codes

Program Listing

```
10 REM   CIRCLES    BY DON DEJARNETTE
20 LPRINTCHR$(2):REM   SETS PLOTTER MODE
30 X=2014:REM   SETS MAXIMUM EXTENT OF X AXIS
40 Y=1000:REM    SETS DIAMETER OF MAIN CIRCLE
50 X=X-50:REM    INCREMENTS X COORDINATE BY -50 POINTS
60 Y=Y-50:REM    INCREMENTS Y COORDINATE BY -50 POINTS
70 LPRINT"G50 X";INT(X);" Y0:REM    MOVE PEN TO STARTING POINT
80 LPRINT"G02 I";INT(Y);":REM     PRINT CIRCLE
90 IF Y<50 THEN GOTO 110:REM   TEST FOR INNER CIRCLE
```

Program continues

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tines are ROM resident within the Plotter and can be called in Basic.

- Paper feed is bi-directional and under software control.
- Paper width is eight and a half inches with a seven and a half inch printing area.
- Printing speed on the smallest character font is 10 characters per second.

The Plotter/Printer is a small computer in itself. It is microprocessor controlled with smart functions resident in ROM. The copy produced by the machine consists of thousands of .09 millimeter straight lines, giving an illusion of a continuous line. There are approximately 1964 points in a seven and a half inch line.

Programming is straightforward and easy. Output to the Plotter/Printer is generated through two types of statements, the character string (CHR$) and the G-Codes. Figs. 1 and 2 illustrate the various functions produced by these statements.

There are two coordinate value systems within the Plotter/Printer: the absolute coordinate value and the relative coordinate value. The absolute coordinate value recognizes one point as the starting point for all X and Y movements. The relative coordinate value is determined by the software. Both systems can function simultaneously, providing great programming flexibility.

The Plotter/Printer is a well-constructed piece of equipment. Board layout is good, with chassis and cover constructed of metal. Connection to the TRS-80 is via the parallel printer port on the expansion interface, which presents a problem if you already have a printer attached to the port. Daisy-chaining the two devices does not work without buffering the cables.

Plotter/Printer output quality is excellent. The type rivals a letter-quality printer, with one major disadvantage: The type is generated in uppercase only. Why Radio Shack chose to eliminate the lowercase feature, while blessing the Plotter/Printer with so many other features, is beyond my comprehension.

The Plotter/Printer has the hardware necessary to become a multiple font letter-quality printer. Imagine being able to select a variety of different type fonts, expanding these fonts to eight times their original size, and integrating graphics with the type, all with software. Unfortunately, the firmware (ROM) to do this is lacking.

Another area in which the Plotter/Printer is seriously lacking is the instruction manual. It is poorly produced and difficult to understand. The manual was copied from a preliminary editor's version complete with typos and editorial comments.

All in all, this is an excellent plotter, and with a little work, an excellent printer as well. ■

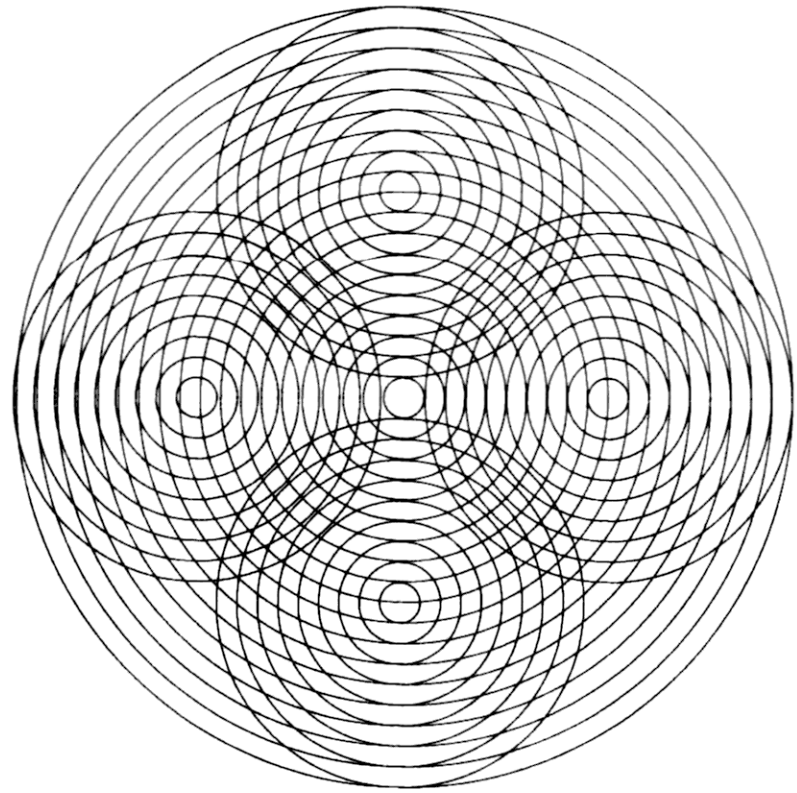

Fig. 3. Circles Plotter Program. This program demonstrates the features of the Plotter/Printer. The pauses are provided to allow pen color changes.

Program continued

```
100 GOTO 50
110 CLS:PRINT"HIT ENTER TO CONTINUE":INPUTA:IFA=0THEN120
120 X=2014
130 Y=500
140 X=X-50
150 Y=Y-50
160 LPRINT"G50 X";INT(X);" Y0
170 LPRINT"G02 I";INT(Y);"
180 IF Y<50 THEN GOTO 200
190 GOTO 140
200 CLS:PRINT"HIT ENTER TO CONTINUE":INPUTB:IFB=0THEN210
210 X=1007
220 Y=500
230 X=X-50
240 Y=Y-50
250 LPRINT"G50 X";INT(X);" Y0
260 LPRINT"G02 I";INT(Y);"
270 IF Y<50 THEN GOTO 290
280 GOTO 230
290 CLS:PRINT"HIT ENTER TO CONTINUE":INPUTC:IFC=0THEN300
300 X=1504
310 Y=500
320 X=X-50
330 Y=Y-50
340 LPRINT"G50 X";INT(X);" Y-500
350 LPRINT"G02 I";INT(Y);"
360 IF Y<50 THEN GOTO 380
370 GOTO 320
380 CLS:PRINT"HIT ENTER TO CONTINUE":INPUTD:IFD=0THEN390
390 X=1504
400 Y=500
410 X=X-50
420 Y=Y-50
430 LPRINT"G50 X";INT(X);" Y500
440 LPRINT"G02 I";INT(Y);"
450 IF Y<50 THEN GOTO 470
460 GOTO 410
470 LPRINT"G50 X400 Y-1500"
480 LPRINTCHR$(1)
490 CLS:PRINT"HIT ENTER TO CONTINUE":INPUTE:IFE=0THEN500
500 LPRINT CHR$(5)      " CIRCLES"
510 LPRINT CHR$(13):LPRINT CHR$(6)
```

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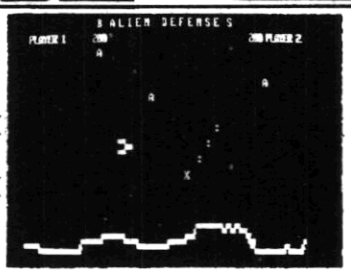

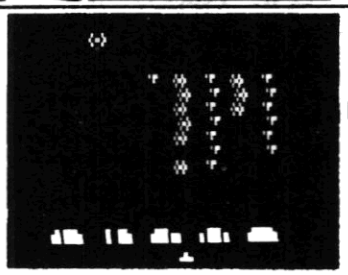

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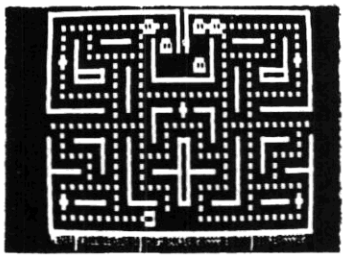

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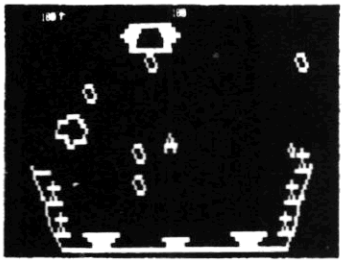

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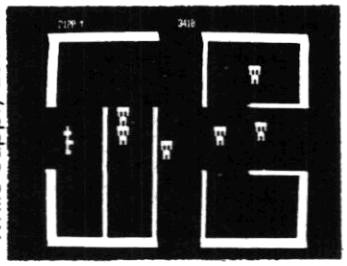

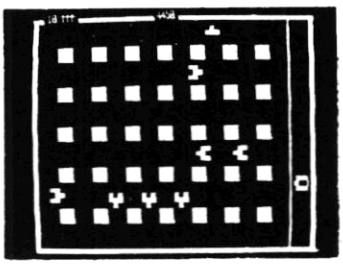

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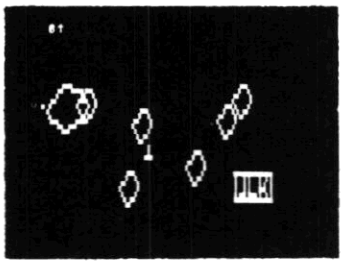

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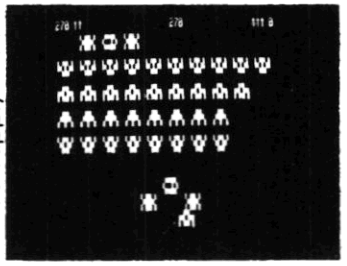

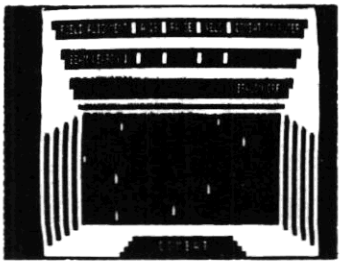

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I have enjoyed watching the steady improvement in the quality and sophistication of available software. Good software takes time to write, and TRS-80 owners are currently in the enviable position of owning a mature machine, at least in microcomputer terms. Hardly a month goes by that someone doesn't announce a new, exciting product, often performing some function that most people thought couldn't be done with a micro.

Tasmon is one of the new breed of TRS-80 machine language monitor programs. A monitor controls the execution of a machine language program in order to debug it, or in the case of examining someone else's program, to discover how it works. You can hit Break to stop a running Basic program, look at the values of your variables, change them and continue running the program. A good monitor lets you stop a machine language program, examine memory locations, change them and continue running the machine language program. Tasmon provides these features and many more.

System Requirements

Tasmon works on a Model I or III TRS-80, and both disk and tape versions are available. I received Tasmon on an easy loading cassette for the Model I. The cassette version includes all the disk commands; tape is merely the medium for distribution. Tasmon is perfectly usable if you don't have a disk, although you can't use the disk commands. Note that none of Tasmon's disk commands are implemented in the Model III version, at least not on Tasmon Version 2.12. If you need Model III disk I/O support, check with The Alternate Source to see if they plan to provide it. The Model III version does support both high and low-speed cassette I/O, although it is done somewhat awkwardly via the monitor's Modify Memory command. You must set the value in location 4211 to zero for 500 baud or one for 1500 baud.

Tasmon is a bit large, occupying about 8K bytes. It is for this reason that 32K bytes of RAM are recommended, although it will run perfectly well in 16K. However, with 16K you have correspondingly less space for your machine language programs that are loaded with Tasmon.

Feature Summary

One of the things that has annoyed me the most in the past while working with other machine language monitors is their incompleteness in terms of available functions. It seems that invariably, while deep in the midst of a hairy debugging session, I find that I need a function from a monitor other than the one I have loaded. This results in the need to perform an awkward sequence of loading several monitors in memory together, trying to make sure that they don't interfere with each other, and then trying to squeeze the program I'm debugging in too.

Assuming that this juggling act can be pulled off, the problem of trying to remember where each monitor is loaded is added to the already difficult task of debugging. Then when the program I am debugging goes haywire, I am faced with the joy of trying to set the whole works up again. In short, one gets more involved with the mechanics of running the various monitors than with the purpose at hand—debugging a program.

Tasmon comes a lot closer to my ideal than any other monitor program I have used. In 95 percent of the situations you face in machine language program debugging, Tasmon makes all the features you need readily available. It does the job of at least four separate programs I previously used.

This is not to say that it is perfect, obviously. In fact, on its very first use I found that a function I wanted was missing—a function that is on many older style, less sophisticated debuggers. I loaded the first copy of Tasmon from tape and ran it. Tasmon includes a relocation feature, by which it can relocate itself anywhere in memory. This feature also works in relocating many other machine language programs. I used it to move Tasmon up to high memory and reentered it there.

The next thing I wanted to do was load the second copy of Tasmon on the tape using Tasmon's system tape load command, and compare it to the original copy to verify that I had a good tape. Both the tape and disk load commands let you specify an offset to add to the load addresses included in the object file. Since Tasmon normally loads from 6000 to 7FFF hex, by typing L T 2000, I loaded the second tape copy of Tasmon at 8000. I then looked

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". . . one gets more involved with the mechanics of running the various monitors than with the purpose at hand. . ."

for a command I could use to compare the two copies, but there's no memory block comparison command.

Adding New Commands

Fortunately Tasmon allows you to add new commands, although the documentation on how to do so is a bit skimpy. It shows you how to get Tasmon to jump to your routine, but doesn't tell you how to access command line parameters, use Tasmon's support routines, and so forth, so you can integrate your command into Tasmon. To his credit, the author of Tasmon has made commented source listings of the program available to its purchasers for $15. These should help anyone trying to extensively modify the program or add truly integrated commands. It is not stated whether the source is available in machine-readable form.

In addition to the commands to load a tape or disk machine language file, Tasmon includes a command to View a file. This tells you the program's name, starting and ending addresses and transfer point without actually loading the file into memory. You can also write a machine language file to disk or tape.

These capabilities allow Tasmon to be used as a general backup and transfer facility for standard (i.e., non-protected) format disk or tape machine language files. For example, you can use Tasmon to move machine language programs from disk to tape, providing a less expensive means of keeping backup copies than using additional disks.

When using Tasmon in this fashion, you should be aware of where the program you are transferring resides in memory so you do not clobber Tasmon itself. As an example, I decided to make a backup tape of a game, which I bought on disk. Since this program runs in 32K, I could safely assume that the last 16K of memory was untouched and available for Tasmon's use. I used Tasmon's self-relocation feature to move it up to D000 from its normal 6000-7FFF location: X 6000 7FFF D000. I then started running the high-memory Tasmon using the Go command: G D000.

Next, I Viewed my disk copy of the game program, just to make sure it wouldn't clobber Tasmon: V D LUNAR/CMD. Tasmon responded with: 7F80 AF60 AF50, meaning that LUNAR/CMD loads from 7F80 to AF60, and starts executing at AF50. This is safe to load, since my high-memory copy of Tasmon starts at D000, so I used Tasmon's Load Disk file command to load it in: L D LUNAR/CMD. Tasmon again responded with 7F80 AF60 AF50, returning the same information as the View command. To make a backup on tape, just type: W T 7F80 AF60 AF50 LUNAR, and the System file will be written on your cassette recorder.

Debugging Features

The handy file manipulation capability discussed above is just icing on the cake, because the area where Tasmon shines is in its debugging commands. About the only thing lacking is the symbolic debugging capability found on some mini and mainframe computers, which allows you to refer to memory locations using the symbols from your assembly source. Of course Tasmon could not possibly provide this capability without access to the assembler's symbol table, which it does not have. As compensation, Tasmon provides many features that the big machine debuggers often lack.

"The handy file manipulation capability. . . is just icing on the cake. . ."

The most novel feature is the ability to trace or single-step through a program in ROM. This means that you can examine the Level II ROM routines in great detail, executing the instructions of a routine one at a time and following their effect on the registers, stopping to examine memory locations, etc. Tasmon accomplishes this neat trick by copying instructions out of ROM and executing them in its own address space. When I think of the way I once laboriously examined the ROM using Radio Shack's T-Bug, looking up each hex opcode in my Z80 manual since I lacked a disassembler.

With the Trace mode on, a disassembly of the current instruction being executed is continuously displayed in the upper right corner of the screen. The contents of all the Z80 registers and alternate registers are displayed below this, and constantly updated. The contents of the memory location pointed at by HL is also displayed. You can continuously vary the speed at which the program is being traced by pressing any key from zero to seven; the zero key sets the rate at about two seconds per instruction, while the seven key is the fastest at about $\frac{1}{15}$ second per instruction.

Note that Tasmon's trace capability is very different from the one provided by the TRSDOS Trace command, which just puts the PC value in the upper right corner of the screen as part of the activity of the interrupt service routine. Since the TRSDOS trace is only updated 40 times a second, and the Z80 executes hundreds of thousands of instructions per second, it is a very crude trace indeed. It can only show a random sample of the instructions being executed. Tasmon's trace command doesn't skip anything; every instruction executed is shown as it happens.

Naturally, this also means that execution during trace mode is much slower than normal full-speed execution; the author of Tasmon claims it is about 5,000 times slower. This means that some routines take quite a while if you trace them in full. This is only bothersome when tracing some ROM routines which take a long time. When tracing routines in RAM, you can set a breakpoint and execute at full speed until you hit it.

When tracing or single-stepping, you may specify whether Z80 Calls should be executed in full or stepped through. This is the same distinction as that between the I and C command in TRSDOS' Debug. One nice twist added with Tasmon is that you can set a floating breakpoint on the next Z80 RET instruction to be executed. That is, you can start single-stepping a Call in full, and when you decide you have seen enough, just hit R while tracing and Tasmon will zip ahead until it hits a RET or conditional RET that is successfully executed. At that time it will stop the trace and give you control again.

Oh, yes, Tasmon also lets you specify whether the Z80 RST instructions should be executed in full or stepped through.

Super Features

Breakpoint setting is extremely flexible. You can have up to nine breakpoints active at any one time. Unlike Debug, where you have to type in the breakpoint address(es) every time you enter the Go command, with Tasmon you just set the breakpoints once and forget them until you want to clear them. That's not all. An extremely nice feature lets you specify the number of times (up to 256) that a breakpoint should be executed before it actually takes effect.

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"Its flaws are minor and more in the wish-list category than anything else."

This means you can set a breakpoint in a loop that gets run through, say, 100 times, and specify that you only want execution to stop on the 50th time through the loop. That's a real time-saver! This breakpoint counter value can be set individually for each of the nine breakpoints.

One more super feature eliminates what is a constant annoyance in Debug and most other monitors. If you have ever tried to Debug a program which writes to the screen, you have no doubt noticed that if you use Debug's single-step command, no sooner has your program written its screen output than Debug wipes it out with its own full-screen display. Tasmon lets you specify a keep-screen buffer in memory. This 1,024-byte area of your own choosing gets the current contents of the screen before Tasmon writes its display out while single-stepping or tracing. You can display the current contents of the buffer for as long as you want to by typing K and holding the Enter key down.

I have found that tracing, single-stepping, breakpoint counter setting and the keep-screen buffer combine to make Tasmon an extremely powerful, well thought out and easy-to-use machine language program debugging tool.

One thing I would like to see added, though, would be the ability to specify a memory buffer whose contents would be continuously updated on the screen during single-stepping and tracing, as in Debug. Tasmon does redisplay the registers and the memory location pointed at by HL, but you must reenter the H <start address > command each time you want to see an update of a memory buffer.

Utility Commands

Table 1 is a complete listing of Tasmon's commands. In addition to those already mentioned, some of the more notable utility functions include the ability to get an ASCII or hex dump of an area of memory, disassemble memory and display the output in Z80 mnemonics, search memory for a key up to four bytes long, modify memory in hex or ASCII, disassemble to the printer, change the contents of any register, perform hex arithmetic (but no decimal conversions, unfortunately), go to a user routine, move a block of memory, set a block of memory to some value and dump the screen contents to a printer.

Disassembler

The disassembly function bears further explanation. It includes a capability for which I once purchased a program costing as much as Tasmon does to do alone. This feature allows you to write a disassembled source listing to tape or disk so that it can be loaded into Radio Shack's EDTASM and be modified and reassembled. The disk files created work with Apparat's or Misosys' modified EDTASM. The beautiful thing about this command is that it adds symbolic labels to the disassembly, so you can choose the ORG address and reassemble the program to load somewhere other than where it did originally. When I think of the time I spent putting labels into a disassembly of Radio Shack's Tiny Pascal so I could move it up in memory and patch it to work with disk . . . good tools make all the difference.

Documentation

The documentation supplied with Tasmon is very complete and professionally done. You get an offset copy of a typewritten manual. You also get a fold-out command reference summary card, a nice touch. There is a table of contents, 22 pages of command usage instructions and 16 pages of sample sessions illustrating Tasmon capabilities in useful ways. The sample sessions include:

- Loading Tasmon, relocating it to high memory and writing it back to disk or tape.
- Loading Small Systems Software's Barricade program (not included) from tape, relocating it to high memory and writing it out to disk.
- Loading a machine language program from disk and executing it by single-stepping, tracing and going.
- Writing the Test/CMD program (supplied in object form) out to disk as an EDTASM source file.
- Loading a machine language file from disk and writing it out as a System tape.
- Using the Trace command to step through the start up procedure for ROM and execute a Basic program.
- Relocating GSF, the Racet Computes utility programs (not supplied).

These tutorials are a welcome addition to the user's manual, and will probably help spark some imaginative usage of Tasmon. While it is complete, the documentation does not pretend to be a tutorial on Assembly language by any means. It jumps right in assuming it is speaking to an experienced Assembly language programmer. This is not to say that the beginning Assembly language programmer wouldn't find Tasmon useful; it certainly is a lot easier to use than T-Bug.

An appendix provides an example of patching in a user command to get hard copy tracing and display of the last seven executed Z80 instructions. This appendix is complete and the patch works, but as mentioned before there is not enough information provided to add commands which are fully integrated into Tasmon.

Printer Support

A couple of Tasmon's features allow you to direct output to the printer. One prints the current screen contents, and the other directs a disassembly to the printer. I personally prefer the approach taken by Small Systems Software's RSM2D monitor, which allows the output of any command to go to the screen; you just terminate the command with the right arrow instead of hitting Enter. I have found that this is more flexible than having different commands for printer and screen output.

This consideration aside, I still have a serious gripe with Tasmon's approach to printer interfacing. Rather than use the standard ROM Call at 003B to put a byte to the printer, Tasmon goes straight to the parallel printer driver in the ROM at 058D. The problem with this approach is that if your printer requires a special driver, as many do, it will not be called. For example, I have a serial printer, and no matter how hard you try, you can't talk to it through the parallel port. To make matters worse, Tasmon also checks the parallel port for printer status before any print commands are executed. Since I have no parallel printer attached, this status check always fails and Tasmon blissfully ignores my request for printout.

Fortunately, I found a way to fix this using Tasmon itself. I will give the patches here as I believe they are of interest to many owners and potential owners of Tasmon.

First of all, you must load your printer driver as usual, and it must store its entry point address in the printer DCB at 4026. This entry point will be called by Tasmon via the ROM call at 003B with the character to print in the C register. This is the standard TRS-80 printer interfacing technique.

Two principal things have to be done to Tasmon itself to use it with a non-standard printer. If your printer does not return status through the parallel port, you must disable Tasmon's status checking of that port. To do this, find all references to the port, address 37E8, using Tasmon's Find command: F 6000 E8 37. My copy showed code at 6971 as follows:

```
6971   LD    A,(37E8)
6974   CP    80
6976   RET   NC
```

This code must be zapped to Z 80 NOP instructions using Tasmon's Zero memory command: Z 6971 6976 00. The only other place I found a reference to 37E8 was at 7861, as follows:

```
7861   LD    A,(37E8)
7864   CP    80
7866   JR    C,786A
7868   XOR   A
7869   RET
```

Again, remove this code by changing it to Z80 NOP instructions: Z 7861 7869 00.

Disassembling further in the above code shows a Call to 79E8 to actually print a character. The code there looks like this in my version:

```
79E8   PUSH   BC
79E9   PUSH   HL
79EA   PUSH   IX
79EC   PUSH   DE
79ED   LD     IX,4025
79F1   LD     HL,03DD
79F4   PUSH   HL
79F5   LD     C,A
79F6   JP     058D
```

The location 058D is the start of the parallel printer driver routine. The code starting at 79E8 must be replaced by a Call to 003B to get Tasmon to print through any printer driver which stores its entry point in the standard printer DCB location of 4026. Register pair DE should also be saved since the Call to 003B clobbers DE. I used the following patch to Tasmon:

```
79E8   D5          PUSH DE
79E9   CD 3B 00    CALL 003B
79EC   D1          POP DE
79ED   C9          RET
```

Use Tasmon's M H 79E8 command to modify memory in Hex, and add the patch. This gives you a version of Tasmon which will call your printer driver; you can save it to disk with the following Tasmon command:

```
W D 6000 7F7B 6000
NEWTAS/CMD
```

Incidentally, if you have to remove the printer port status check code as mentioned above in order to get Tasmon to print with your system, you will need to perform similar surgery on the patch listed in Appendix C. This patch adds a hard copy trace disassembly of a running program, which is a very useful feature. In my version, the code which checks printer port status (location 37E8) was located from 7FD6 to 7FDB, and I removed it with the command: Z 7FD6 7FDB 00. After doing this, the hard copy trace command worked fine.

I have found Tasmon to be an indispensable aid to debugging, moving machine language files around, and just generally exploring Z80 code. Its flaws are minor, and more in the wish-list category than anything else. It does the work of several programs selling for the same or a higher price, and I heartily recommend it. ■

Dump memory in ASCII	Skip instruction at PC	Write a CMD disk file
Display breakpoints	Back up user's PC	Relocate Z80 code
Clear all breakpoints	Modify memory in Hex	Block move memory
Exit TASMON	Modify memory in ASCII	Set block of memory to specific value
GOTO address and run	Set up to 9 breakpoints	Dump screen to printer
Dump memory in Hex	Clear specific breakpoint	Clear screen and display registers
Toggle Restarts between step through and execute in full	Disassemble memory in Z80 code	
	Find up to 4 byte search key in memory	
Allocate a "keep screen" buffer	Single step, CALLs stepped through	
Load SYSTEM tape with optional offset	Single step, CALLs executed in full	
Load CMD disk file with optional offset	Display user's "keep screen" buffer	
Output disassembled source with labels to tape or disk	Set breakpoint counter to N	
	Initialize all breakpoint counters to 1	
Add or subtract two hex numbers	Initialize all breakpoint counters to "set" values	
GOTO a User routine	Disassemble to the printer	
View a SYSTEM tape; returns filename, starting, ending and entry addresses without loading memory	Replace register pair contents	
	Trace with CALLs stepped through	
	Trace with CALLs executed in full	
View a CMD disk file	Write a SYSTEM tape	

Table 1. Tasmon Command Summary.

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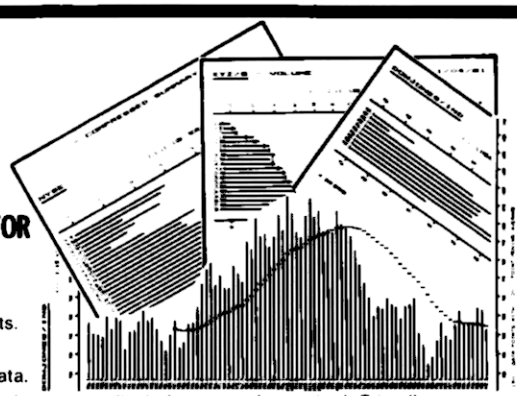

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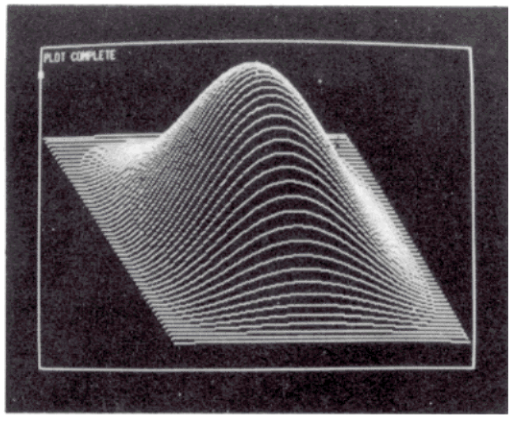

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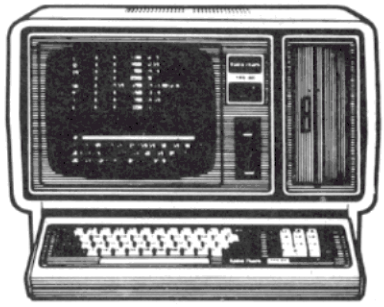

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If you spend 20 to 60 hours per week at a Model II developing complex programs in Basic, you've probably already discovered Snapp, Inc.'s Extended Basic Enhancements. They solve some of the more frustrating problems with the Model II Basic interpreter.

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The sorting speed is impressive. Program Listing 1 fills an integer array with 10,000 descending numbers. Line 110 sorts the array.

The amount of time that Basic needs to fill the array is 52 seconds, but Snapp III can sort it in 36 seconds. (Oh, I must mention that the program ran the first time without error.)

XTIM$ is another Built-in Function used in Listing 1. It returns the time in a string as does Radio Shack Basic's TIME$, but it doesn't require a separate fetch of a TRSDOS overlay, and it is more efficient.

ETIM$ calculates the difference between two time strings. In Listing 1, line 80 calculates the difference between T1$ and T2$. In line 120 I use ETIM$ to calculate the difference between T3$ and the present computer time.

XDAT$("") displays the date. The great thing about XDAT$ is that it gives you the date in month/day/year format.

To extract the date from Radio Shack's Basic DATE$ requires a number of string functions and gives you the date in the following format: SunApr 51981 95 46.

```
10 CLEAR 1000:DEFINT I-K:CLS
20 DIM K(10000):J=10000:T1$=FN XTIM$("")
30 FOR I=0 TO 10000
40 K(I)=J
50 J=J-1
60 NEXT I
70 T2$=FN XTIM$("")
80 PRINT"It took "+FN ETIM$(T1$,T2$)+" to build a descending array of 10,000 integers"
90 REM Now let's sort it
100 T3$=FN XTIM$(""):REM Get the start time
110 I=FN SRT("+KX"):REM  Sort it
120 T4$=FN ETIM$(T3$): REM Compute the sort time
130 PRINT"It took "+T4$+" to sort the array"
140 END
```

Program Listing 1

If you haven't noticed yet, none of the Snapp functions requires a DEF FN statement. Even if you should get an error, Snapp's manual clearly explains most probable causes.

I never understood why Model II Basic doesn't allow you to read information directly from the video display as the Model I did, but with VIDEO$, another Snapp function, you can. Its syntax is FN VIDEO$(row, column,number of characters to be read).

After running Listing 1, if you enter the command Print FN VIDEO$(1,0,16), it prints the following on the screen: It took 00.00.36.

I use the ID$ function to be sure that our software users insert the proper disks into each drive. For example, PRINT FN ID$(2) displays the name of the disk in Drive 2.

While you are checking your disks, you may want to be sure that you have allowed the correct number of buffers for transferring information to and from your disk files by entering Print FN Files. This displays the current number of allocated file blocks. If you enter Basic under Snapp III with the command BASIC -F:2 and then attempt to execute the command OPEN"I",5,"DATA-FILE", you would get the following error statement: Bad File Number (52) ?BN Error.

Normally Model II Basic only displays ?BN Error.

If you prefer the abbreviated message, Snapp gives you the option. SCMD "LMSGOFF" returns the error messages to their normal state, while SCMD "LMSGON" displays error messages in Snapp's long form.

Snapp's FN MAX returns the largest value from your supplied list, and FN MIN returns the smallest value from your list. It converts all supplied values to double precision; it selects the largest or smallest, then it converts to the numeric type that you request.

The functions FNUC$ and FNLC$ take a given string expression and convert each byte to upper or lowercase.

FN FMT$ arranges data into a string

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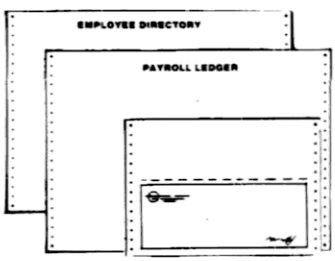

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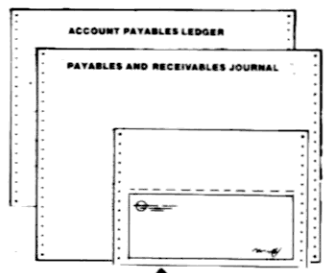

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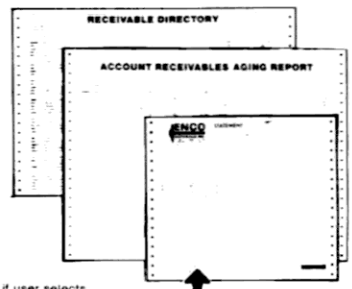

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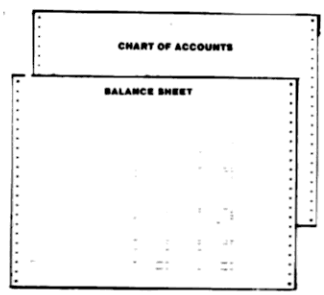
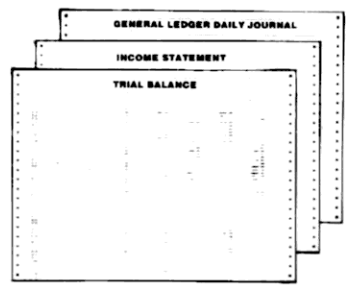


GENERAL LEDGER



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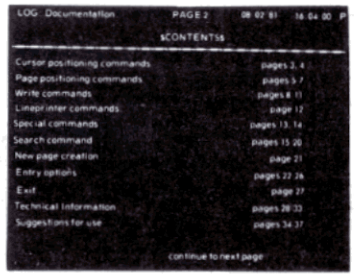

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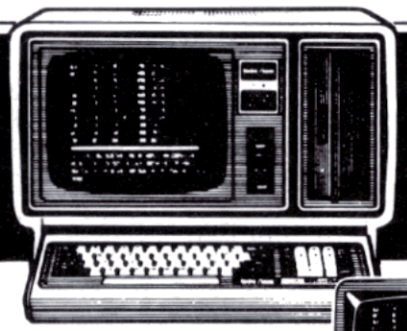

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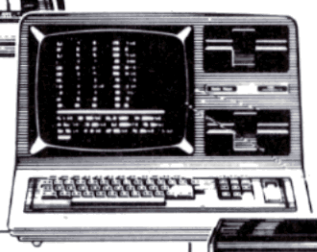

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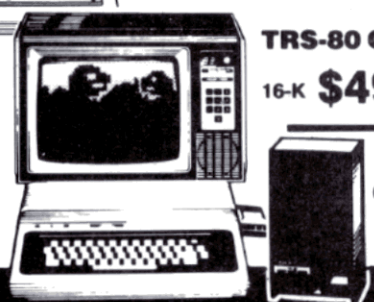

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"I thought I had seen it all until I received Snapp IV, their Extended Basic mapping support."

variable in the same manner as Basic's PRINT USING. If you enter PRINT FN FMT$("GOODBYE###";10), the screen displays the following: GOODBYE 10.

I must admit that, when I first saw this function, I wondered how or why I would ever use it. But, FN FMT$ is a real "sleeper." Any programmer who manipulates numbers and mixes them with strings for printing or storage will soon find himself saving a tremendous amount of computer time and memory space by using FMT$.

For those of you who can't stand programming without PEEKing or POKEing to the innards of TRSDOS or Basic, Snapp also provides a number of those functions that allow PEEKing or POKEing bytes, words or entire strings.

As an example, if you enter PRINT FN PEEK($HOF6B), the screen displays the number of lines that have been printed on the current page of your line printer.

Snapp Commands

OPEN"E" allows you to open a sequential file and add to it. Normally, Basic requires you to open the file and read the entire contents into memory before you can add to it. Afterward you must rewrite the entire file to disk.

SCMD"RUN" lets you run a new program from Basic and allocate a different number of buffers for data going to and from the disk.

If you have accessed Basic from TRSDOS with BASIC-F:2 which allocates two file blocks, and your next program requires five file blocks, all that you need do is enter SCMD RUN"NEWPROG",5 and five file blocks are allocated. Your program, NEWPROG, will be up and running.

You can also use SCMD"CLEAR" which sets file buffer space, string space, and/or memory size, all while running a program.

If you need more memory space while your program is running, you can use SCMD"ERASE", which eliminates all arrays currently in use.

Snapp also enhances video display controls with its SCMD"ROW" for example, that allows you to protect a portion of the screen from scrolling.

With SCMD "VDOFF" you can completely turn off the video display, which is advisable during extensive updates of the screen. It spares you from seeing all the flickering and streaking on the screen. To turn the video back on, type: SCMD"VDON".

Also, SCMD"CURSOR" allows you to change the blink rate and the size of the cursor, or to remove the cursor altogether.

Auto Map

I thought that I had seen it all from Snapp until I received their Extended Basic mapping Support, Snapp IV.

Consider writing a program that does the following:

- Open a sequential file and input up to 99 items.
- Print all 99 items on the screen with prompts.
- Input changes to any or all of these items (which will be referred to as fields from now on).
- Rewrite the updated file.

Reading or writing files is easy, but with 99 print statements, 99 prompts and 99 input statements, I hope that you have a 64K Model II and plenty of time! You may need it. Take a look at Program Listing 2 which with the help of Snapp IV, does all of the above and more.

With Auto Map you can display the prompts and all 99 data items after executing line 130.

An off-line program called Generate/BAS develops the screen display. By off-line I mean that you don't need it during the execution of your program.

Generate/BAS creates the image of your information on the video display. In Listing 2, line 80 initializes the display named DISPLAY1. Generate/BAS assigns each piece of data to a field with its own attributes. The attributes include the row and column of the display and a caption, which is the same as a prompt in an input statement. (You can display the caption and/or data in reverse video if desired.)

Field length defines the maximum number of characters to be displayed or accepted from the keyboard, and can be displayed in reverse video also. You can also protect the field, which means that you cannot modify its data from the keyboard.

The next attribute is the variable name. This can be a simple variable such as A$, a subscripted variable such as A$(5) or it can contain an expression such as J%(I + K + 5). When the variable is numeric rather than string, Generate/BAS asks if you would like to accept only positive numbers, and it allows you to specify a limit to the number of decimal places.

While you're creating a screen, Generate/BAS displays a prompt line on the bottom of the video display giving you all the current options. These normally include <A>dding a new field, <I>nserting and <E>diting a field. <N>ext moves the cursor to the next field. <P>revious moves the cursor to the previous field. <D>elete discards a field. <S>ave saves the current screen to a file named earlier.

After you set the field's positions, the arrow keys will move any field to a new location. This makes designing a "pretty" and professional screen display very easy. All too often good programs are spoiled with sloppy screen displays.

After sending a screen to the video display with SCMD"SEND", the screen immediately goes blank until the entire video is updated. The display then turns on. Any unfilled data areas will contain a series of small graphic blocks showing where you can enter data. The cursor does not appear until SCMD"RECEIVE" is encountered, at which point it jumps to the beginning of the first or any selected data area.

If you enter the last allowable character in a data area, the cursor then jumps to the first character in the next data area. (No more PRINT@'s followed by input statements.) This continues until you press ENTER,F1, or F2 which ends the SCMD"RECEIVE" command.

While entering string data, use the arrow keys to position the cursor over a character that needs correcting. There is no need to retype the line.

The tab key moves the cursor to the next field while Escape is a "back tab." The up-arrow acts as an express back tab, moving the cursor to the first character in the previous line, while the down-arrow is an express tab to the first field in the next row.

The first time I used Auto Map I was amazed. I designed a screen that input and printed latitude and longitude in degrees, minutes and seconds, an identification string, a date and time, and a special fifteen character serial number, all with no errors.

Updating this information from my files is surprisingly easy with Snapp's cursor controls. Try the software yourself. I'm sure you'll wonder how you ever got along without it.■

```
90 DIMJ(99)
100 OPEN"I",1,"DATAFILE"
110 FOR I=1 TO 99:INPUT#1,J(I):NEXT I
120 CLOSE
125 SCMD"INIT","DISPLAY1":REM Initialize screen
130 SCMD"SEND"
140 SCMD"RECEIVE"
150 OPEN"O",1,"DATAFILE"
160 FOR I=1 TO 99:PRINT#1,J(I):NEXT I
170 CLOSE
180 END
```

Program Listing 2

FANFARE™

by Jon Bokelman, author of Orchestra-80, 85 and 90

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A few years ago I purchased a TRS-80 for two reasons. First I wanted to learn something about computers. Second, I had acquired copies of a good number of parts catalogs, covering 19 years of Model T Ford production, and I wanted to compile a master catalog of these parts listings.

I've developed a program to handle the parts books over the past two years using approaches I have yet to see published. While it is not likely many will ever duplicate *this* program (how many nuts would spend so much time sorting Model T parts?) it would be applicable to other cataloging programs.

There's little information on organizing disk files for reasonably rapid access. The TRS-80 manual hints that random files must have file numbers and that if you want a particular file, you address it using that number. But how do you know the file number without some form of an index?

Part numbers have a logical sequence, usually incrementing upward as parts are added. Model T parts begin at 2500 and extend into the 6000 range. My approach was to use the part numbers themselves as the source for the file numbers. My initial plan was to use a separate disk for each 100 parts. This takes quite a few disks and may not be the most efficient method, for some disks are almost empty while others are almost loaded. The file numbers are derived from the last two numbers in the part numbers.

What do you do if you have more information to file than can be handled in the 255 bytes of a single file? Here I had a part number, a description, a short note and 19 years of prices. If Ford had had me in mind 60 years ago, they could have made it easier, but instead they also used factory numbers that did not necessarily relate to part numbers. They also changed them from time to time, so additional files are required to handle factory numbers.

It didn't take long to discover, too, that they discontinued part numbers for a time and then reinstated them, but for entirely different parts. This discovery didn't help my file access method at all for the second entry overwrote the first one. A further complication appeared when they added letter suffixes (2500B, 2500C).

Early on in the data entry the need also was found for some method to elaborate on some items, either a more detailed description or a history of the evolution. My first format listed entries by part number, up to 15 additional part number files accessed directly from the initial file, and each of the above with its own factory number file and up to three more comment files for each of these files—a possible 80 files from one initial part number entry! And all are accessible by the disk file number directly rather than by search of the disk files.

Initially, the program worked well with this format. Unfortunately, in the 2800 series of numbers, the required number of files overloaded the disk making it necessary to break the files down to just 50 per disk—the 2800 to 2849 numbers on one disk and 2850 to 2899 on another. A routine was developed to initialize the program for either a file length of 100 or of 50.

As programs grow, memory requirements grow too. When the program gets to the point where there's no room in memory to operate it, something must give. The original program had the entering, editing, viewing and printing routines all together. These were later split into three programs: Edit, Print and Menu.

However, the printout requirements were for upper and lowercase, which required a routine to enter upper and lowercase when entering the data. This can be done if one remembers to shift for lowercase when using the TRS-80, but since the normal screen only shows uppercase, it can become confusing. Radio Shack now has a conversion for upper/lower, but in my case I installed the Electric Pencil version (this was before RS had theirs). Early on, I found the shift for lowercase a bother, so there is a conversion routine in the program to make reversal. The Menu program initializes the screen routine (lines 10 to 16). Typing is still reversed but the routine in the Edit program (10000 to 10022) converts the reversed entry to standard form (i.e., dATA is changed to Data. It's a bit slow for long entries, but easier than typing backwards.

How the Program Works

The Edit program is the result of more modifications (from the original version) than I can remember. As a result, there is not a great deal of logic in the layout of many routines. The program is listed only as an illustration of one way to do things, *not* as the only way.

The initial part number entry routine begins at line 100 and ends at 194 (see Program Listing 1). There are a number of subroutines called up but parts of this group are subroutines. This was done because these subroutines are called up elsewhere in the program when adding auxiliary part number files.

Subroutine (S/R) 9190 is a null routine for the auxiliary file numbers. S/R 9160 nulls the parts file buffer. S/R 252 selects the location on the disk. S/R 9000, 9100 and 9300 are disk/buffer routines. The nulls are not necessary in all cases of entry, but prevent unwanted data from appearing when an old file is overprinted or, elsewhere in the program, when auxilliary files are added that use the same strings and buffers.

The initial part number entry allows the part number, the factory number, a description and notes to be entered in Pfile1, then the factory number and additional notes to be entered in Pfile2. Pfile1 allows two part numbers to be filed in each disk segment, while Pfile2 requires an entire segment. The disk file number is the same for both of these files.

After completing the above entry, the Edit mode is called up and additional entries can be made in either file. (Auxiliary files can also be added at this time, but are generally done later as data is being inputted.) Hitting Enter after the entry routine brings you back to the beginning

for another number.

The Edit routine begins at 500. If called up from the menu, Edit begins at 500. When called from New (the one described above), the routine begins at 515. When called up for an auxiliary part number, it begins at 512. The different entry points bypass null routines that are not required in certain functions.

Throughout the program are control numbers: C, C2 and C9. These control numbers (set at either one or zero) determine the return points of subroutines or the file length. C2 sets the file length (50 or 100) as described later. If C2 is one the file length is 50; zero sets it at 100. C9 is set to one if the files are accessed from the auxiliary file routine, zero if from the main file.

Early in the data entry process a sequential access of files was needed. Since I had about 60 parts books to sort through, entering a part number for each part became a chore. The routine at 1800 allows each part to be accessed from any beginning number to any ending number; the next number is called up by pressing Enter. (Of course, all auxiliary files can be accessed from the called-up file.) The control number for this is C. If C = 1, the sequential routine is active; If C = 0, the individual part number must be entered.

The auxiliary file numbers are control numbers in some cases, particularly to call up the headings for the mail part file.

Multiple File Access

The initial part number filing routine dedicated the first 100 files of Pfile1 so any additional entries would have to begin at 101. All auxiliary part number files are added in sequence and their file number is stored in the initial part number file. When the initial number is entered, its printout shows the part number and prices. Each description is prefixed with a number that identifies it for editing. In addition to the usual part data, there are three file number listings, 5 and 6 for two similarly formatted files that allow five part number/factory number/date entries, plus about 30 words of comments (154 bytes). File 7 is a 255-byte comment file (unformatted except for five lines to allow easier editing at a later date). File 8 is a string that identifies file numbers for part numbers that are in the same family as the initial file. Up to 15 additional files can be listed, each with its own factory number file and the three note files (5, 6 and 7).

Each of these additional file numbers is saved as an integer, which saves space: files 5, 6 and 7 in the Pfile1 field (the initial part number field), and file 8 in Pfile2 (the factory number file). Since both Pfiles are called up initially (upon entry of the initial part number), this data is in the buffers. There are two different fields for these numbers because there wasn't room in either file alone for all the part data.

These auxiliary file numbers are identified as R1 through R9 and S1 through S9. They may be changed and their order shifted by routines when each file is called up. For example, if five is pressed, the screen asks, "Change number (Y/Ent)". If Y is entered, the new number is requested and when entered becomes the new file number. If Enter is pressed, the actual file is called up for viewing or editing. This file number editing allows shifting the order of the auxiliary files so they are in alpha-numerical order, or the call-up of the same auxiliary file from two or more initial (or auxiliary) files. The file eight routine only appears on the initial entry (or main file) printout. While it would be possible to access another 15 auxiliary files from each auxiliary file, I have not found it necessary.

```
5 CLEAR3000
10 CLS:FORI=-30TO-1
11 READB
12 POKEI,B
13 NEXTI
14 POKE 16414,226:POKE16415,255
16 DATA221,110,3,221,102,4,218,154,4,221,126,5,183,40,1,119,121,
254,32,218,6,5,254,128,210,166,4,195,125,4
18 PRINTSTRING$(58,"=")
20 PRINT"------------------ BASIC PART FILE MENU ---------------
---"
22 PRINTSTRING$(58,"=")
25 PRINT:PRINT:PRINT
30 PRINT TAB(15)"1. PRINT OR LINE PRINT FILES"
35 PRINT
40 PRINT TAB(15)"2. EDIT OR ADD TO FILES"
45 PRINT:PRINT
50 PRINT"SELECT: ";
51 A$=INKEY$:IFA$=""THEN51
52 IFA$="1"THEN60
53 IFA$="2"THEN70
54 GOTO51
60 PRINTA$:RUN"PRINT"
70 PRINTA$:RUN"EDIT"
```

Program Listing 1. Menu

```
BASIC PART FILE MENU

1. PRINT OR LINE PRINT FILES
2. EDIT OR ADD TO FILES

SELECT:
```

Table 1.

```
PARTS FILE MENU

1. TO ADD TO PARTS FILE
2. TO EDIT PARTS FILE
3. TO PRINT PARTS FILE
4. TO CHANGE FILE LENGTH

FILE LENGTH IS 50
SELECT NUMBER
```

Table 2.

```
                        EDIT PARTS/PRICE FILE
[1] PART # 2800         [2] FACT # 291B *       [3] FRONT WHEEL
[4] NOTES: 30 x 3 CI.                           [5] NOTEFILE (A) 1 ,[6] 0
[8] AUX. 41 / 9 / 16 / 17 / 18                  [7] NOTEFILE (B) 0
        19 / 29 / 30 / 42 / 43                  0 / 0 / 0 / 0 / 0
                                PRICES
1909            1913            1917            1921            1925
[9]  12         [13]  0         [17]  5.5       [21]  10        [25]  6
1910            1914            1918            1922            1926
[10]  12        [14]  0         [18]  7         [22]  8         [26]  6
1911            1915            1919            1923            1927
[11]  8         [15]  0         [19]  8         [23]  6.75      [27]  6
1912            1916            1920            1924
[12]  7         [16]  0         [20]  12        [24]  6.25
SELECT NUMBER (N = null, X = end, ENTER = next)
```

Table 3.

"The Edit program is the result of more modifications... than I can remember."

If there are no auxiliary files entered for a given number, calling up the file automatically accesses the next available empty file (EOF plus one) and saves its file location in the applicable R1 through S9 file under eight. The program goes into the new routine and whatever you enter becomes the new file. If there are no auxiliary part number files entered, the entire eight line does not appear on the screen but entering eight still calls up the routine. Once an auxiliary file is saved, the eight line will print. If there are fewer than six auxiliary part number files entered, eight will show only the first five (if less than five files have been entered, the file numbers above the numbers previously entered will show as zero). When the sixth auxiliary entry is made, the second group of file numbers will appear below the first group.

The auxiliary part files (R4 through S9) are accessed either after entering the eight by entering the desired part number (e.g., 2500B), or sequentially beginning with the first entry. The routine for this access is in lines 1100 through 1275. When the eight is entered, after the change number routine, the screen asks for the part number. If a number is entered, the files (R4 through whatever numbers are entered) are searched until a match is found. If such a number has not been filed, the screen asks if you want to enter a new file or return to the main file. If your answer is yes, then the new number entry routine is called up. If no, the original file is recalled.

If no part number is entered, and Enter is pressed, the program prints each record in order until all of the auxiliary part number files have been called up.

Either of the two auxiliary part file accessing systems can be ended at any point, so it is not necessary to view every file once the one required is found.

```
                    EDIT FACTORY NUMBER FILE
PART # 2800              FACT. # 291B *          FRONT WHEEL
NOTES: 30 x 3 CI.                          NOTEFILE (A) 1, 0

FACT #          CATALOG YEAR/NOTES
(1) 291         ( 8) 1909-1912 (Red)
(2)             ( 9) — USED 1909 —
(3) ——          (10) ——
(4) 291         (11) 1917-1920
(5) 291B        (12) 1920-1926
(6) 291BR       (13) 1927
(7)             (14) — FOR 1909-1925 —

CHANGE? (# OR 'ENTER' ('N' TO NULL))
```

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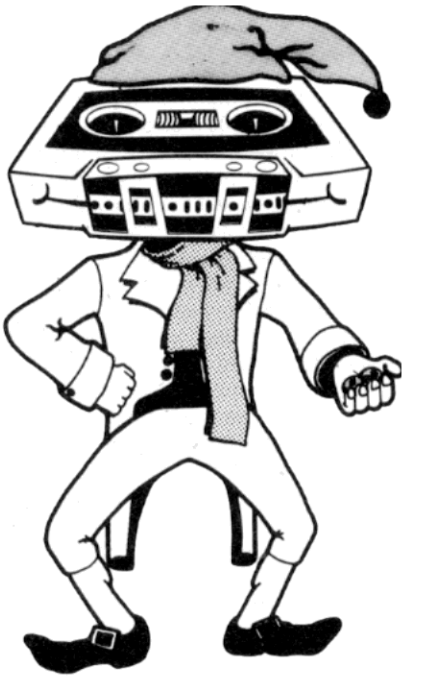

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"Inkey functions are used throughout the program to access editing functions, files, and so on."

Inkey Functions

Inkey functions are used throughout the program to access editing functions, files, and so on. Considerable time is saved during the editing process when updating files. This function, of course, consumes memory when compared with the usual "On X GOTO" system.

It's easy to use Inkey if the functions are called out by one number or one letter, but it gets a bit more complicated if the number is 10 or more. I handled this by making the first Inkey entry refer to another *if* there was the need for a double entry. (For example, if you want to select either two or 20, how do you tell the difference?) When the possible selections ran into the teens or twenties the first one or two switches to another routine. If the desired number is either one or two the Enter key is pressed and the proper routine is called up. If the second entry is another number, then its corresponding function is called.

An example of this is seen beginning at line 520. The Inkey routine goes to 400 (this was added later, after the essential parts of the program had been developed, and there was no room for the additional entries in the logical order) where the dual entry routine continues. (The use of "A1$" in lines 410 and 420 is due to a previous system; "A$" could have been used throughout.)

A different approach would use 01, 02, etc. for the numbers from one to nine, but this means that you have to enter the extra zero for every entry below 10. I have found it easier to hit Enter *after* the initial number. In this program, the editing call-ups are under 30 so it is only necessary to hit the Enter key for one and two. Three to

NOTE FILE # 1 FOR PART # 2800

PART # 2800 FACT. # 291B * FRONT WHEEL

NOTES: 30 x 3 CI. NOTEFILE (A) 1, 0

PART #	FACT #	YEAR INTRODUCED
[1] (1) 280-0-1-2	(6) 291	(11) 1909
[2] (2) 2800B	(7) 291	(12) 1913
[3] (3) 2800	(8) 291	(13) 1918
[4] (4)	(9)	(14) 0
[5] (5)	(10)	(15) 0

(16) NOTES: 2800, 2801, 2802 are wheels of different colors.
(17) NOTES: 2800B replaced all three plus 2802B in 1913.
(18) NOTES: 2800B changed to 2800 in 1918 catalog.

CHANGE ? (# OR 'ENTER')

Table 5.

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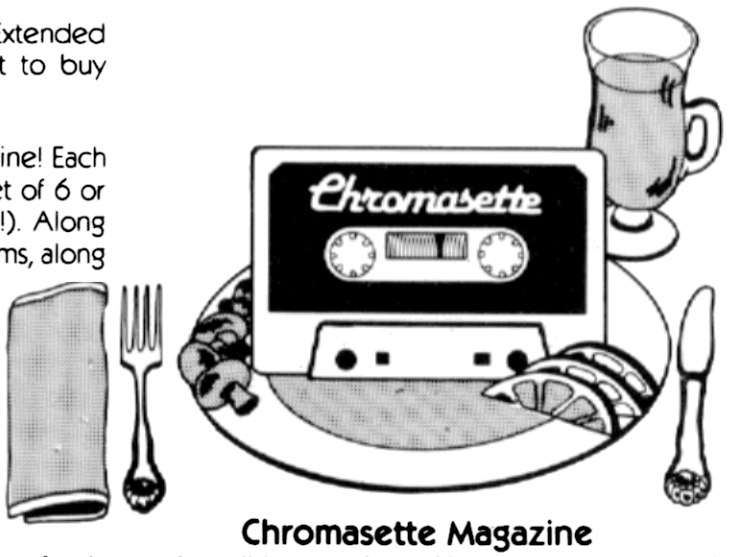

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". . . two routines are used in the program to effect the conversion from the usual TRS-80 printing mode."

nine act on the first entry.

The Inkey function also makes it easy to call up other functions such as Null, End or Next directly.

Upper and Lowercase

Since my requirements were for a printout in upper and lower-case, two routines are used in the program to effect the conversion from the usual TRS-80 printing mode. My computer had already been modified, as mentioned earlier. The routine in the Menu program enters a machine language program in high memory. This routine is in lines 10 to 16. When calling up Basic the memory size is set to 65505. (The number of files is also set at four since there are four different files accessed in the programs.) As soon as the Menu program is Run (and the Electric Pencil control switch is set) the computer will print upper and lowercase. This is fine but you must shift for lowercase.

To solve this problem, another routine (lines 10000 to 10022 in the Edit program) is called up after each entry where upper/lowercase is desired. When typing in the data, the entry is reverse—upper shows as lower and vice-versa. The routine reverses this and the proper format then appears on the screen. I'm sure there are better ways to do this, but I don't have them available. Note that not all entries access this routine. Part numbers, dates, and so on are normally all caps anyway, so the standard input is used. The reversal process is a bit slow, depending on the length of the typed line, but it's better than shifting with one hand and typing a line with the other!

```
                    EDIT PARTS/PRICE FILE
[1] PART # 2800A1          [2] FACT # 291J          [3] FRONT WHEEL
[4] NOTES: 30 x 3-1/2 Cl.                           [5] NOTEFILE (A) 0 ,[6] 0
                                                    [7] NOTEFILE (B) 10
                              PRICES
1909          1913          1917          1921          1925
[9]  0        [13] 0        [17] 0        [21] 0        [25] 6
1910          1914          1918          1922          1926
[10] 0        [14] 0        [18] 0        [22] 0        [26] 6
1911          1915          1919          1923          1927
[11] 0        [15] 0        [19] 0        [23] 0        [27] 6
1912          1916          1920          1924
[12] 0        [16] 0        [20] 0        [24] 0
SELECT NUMBER (N = null, X = end, ENTER = next)
```

Table 6.

Strange Routines

Some of the program routines might seem strange. Not all are necessary for program use, but apply to a particular application. One of these is line 12. Two

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"The TRS-80 does not have true brackets, but the two ASCII callouts will print them."

strings are defined: LB and BR. These are for a left bracket and a right bracket used in some of the display formats. The TRS-80 does not have true brackets, but the two ASCII callouts will print them. I have usually used less-than and more-than signs in programs when I needed something a bit different from the usual (" or "), but the Xymec printer prints 1/2 and 1/4 for them—not very appropriate. The Xymec does print brackets, though, and they respond to the same ASCII number as the TRS-80 brackets. The use of these two strings can be seen in lines 2061 to 2067, among other places.

Interestingly, you can change the brackets on the CRT printout to any number of graphics blocks by just changing line 12 to the proper ASCII number.

The routine initiated in lines three to seven, which set the file length to either 50 or 100 by establishing a value of C2 (1 for 50, 0 for 100), needs a little explanation. In the usual format (100), part numbers from, say, 2500 to 2599 will be assigned to disk files 1 to 99. Early in the editing process I discovered there was just too much data in some part number sequences to get it all on one five-inch disk, so the file length was changed to 50. This allowed the auxiliary files to be located after the fiftieth main file. By using the C2 control function, the End of File starting point is reset, and auxiliary files can be found in their new locations. In addition, the second 50 part numbers are assigned new locations, ie., P/N 2551 gets the same place that 2500 would be assigned. Wherever the C2 control is seen in Program Listing 1, you can see the mathematics involved resets file locations.

Almost all of the screen printing formats are in subroutines (1000, 1191-1192, and 2000-up). Most of the operational subroutines begin at 9000. These are the disk routines, nulls, buffer formatting, and so on. The routine at 9500 determines the

```
                    NOTEFILE B # 10 FOR P/N 2800A1
PART # 2800A1              FACT. # 291J              FRONT WHEEL
NOTES: 30 x 3-1/2 CI.
                                                     NOTEFILE (B) 10

                              NOTES
(1) The above examples are of a main file, the factory
(2) file for the main file, and one Note File.
(3) This is a sample of Notefile (B), accessed from
(4) an auxiliary file such as 2800A1 above.
(5)

CHANGE? (# OR 'ENTER')
```

Table 7.

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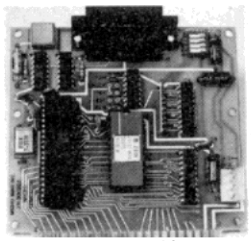

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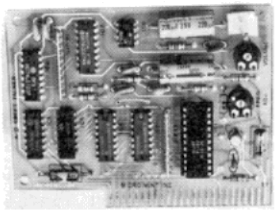

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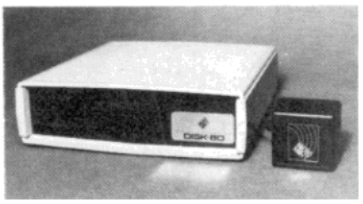

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"While viewing auxiliary files, the location of the main file must be retained."

location of the file number for line 8 in the main part display. It searches to find the first zero (no file) and assigns the new file number to that location.

Line 9700 is the routine to edit or change numbers at eight. Note that there are just 15 files available but that 16 can be called. Sixteen is the null routine that sets the other 15 to zero.

While viewing auxiliary files, the location of the main file must be retained. Since the same string numbers and buffers are used for all these files, the originating number is retained so it can be called up when you have finished with the auxiliary files. This is the purpose of line 1100 and 1230. Line 1103 was added later when it was found that if you entered the wrong number, or anything else at 1102, the auxiliary files would return to the first number in the disk file instead of the proper one. The program then would reassign the file numbers that were in the original callout to the first number in the disk file. This meant a time-consuming search to see what really belonged in the beginning file. Line 1103 in effect says, "Come on now, I want only numbers of the same family as the ones I'm working with now!" and returns you to the "what number" question.

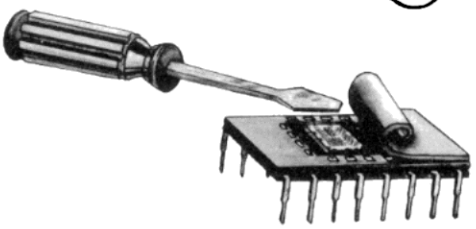
There are no known bugs in the Edit program. Changes continue to be made as

Program Listing 2. Edit

```
1 CLEAR 3000
2 CLEAR:CLS
3 PRINT"FILE LENGTH 50 (F) OR 100 (ENTER)"
4 A$="":A$=INKEY$:IFA$=""THEN4
5 IFA$="F"THENC2=1:GOTO10
6 IFA$=CHR$(13)THEN10
7 GOTO4
10 CLS:CLOSE
15 PRINT@23,"PARTS FILE MENU"
20 PRINT"------------------------------------------------------
--------
21 PRINT:PRINT
25 PRINT TAB(16)" 1. TO ADD TO PARTS FILE
30 PRINT:PRINT TAB(16)" 2. TO EDIT PARTS FILE
35 PRINT:PRINT TAB(16)" 3. TO PRINT PARTS FILE
40 PRINT:PRINT TAB(16)" 4. TO CHANGE FILE LENGTH
70 IFC2=1THENC2$="50" ELSEC2$="100"
72 PRINT:PRINTTAB(11)"========== FILE LENGTH IS ";C2$;" ========
==="
75 PRINT"SELECT NUMBER"
76 A$="":A$=INKEY$:IFA$=""THEN76
77 IFA$="1"THEN100
78 IFA$="2"THEN1820
```

Program Listing 2 continues

Accessing the TRS-80* ROM...



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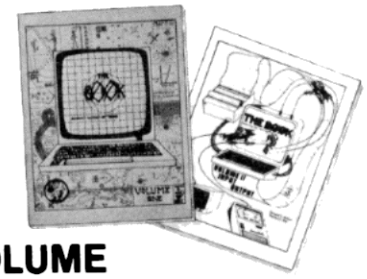

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"Null is convenient when a file is called that has not been entered previously."

new ideas crop up, but after literally days of entering data, it always works.

Special Functions

After a part file has been called up, a list of commands are printed at the bottom of the screen: Select Number (N = null, X = end, Enter = next). If a number is entered, that line is called up for editing.

Null is convenient when a file is called that has not been entered previously. When this is done, the disk location is called, but the screen is filled with trash from whatever happened to be on the disk at the time. Null sets everything in the particular disk file to zero (or null) so that the new data can be added without the garbage. Each file must be nulled separately. If null is called from the part number file, only that file is nulled. If called from the factory number file, only that file is nulled. The string of numbers under eight, while a part of the factory number disk file, require another null. All three of these would be nulled automatically if you were entering the number from the new routine, but being able to null separately makes the editing more convenient.

Enter will do one of three things, depending on which mode of operation you have previously selected. If the part number had originally been called by entering its number, Enter will ask for another number. If you are in the sequential mode, Enter calls the next number. If you are in one of the auxiliary part number files, Enter will ask for a new number or will call up the next, again depending on the mode of access selected for the auxiliary files.

End will return you to the Menu if called from the main file, or will return you to the main file number if you are in the auxiliary files.

The Menu lists "To Print Parts File" which, if called, asks (again) if you want the print file. If the answer is yes the print program is called. This program is almost as long as the Edit program and is not listed here. I have two printers and the program has routines for the different formats I use in printing the part number data. In addition, files can be viewed on the screen (but can't be edited).

The Yes or No is asked to prevent loading the Print program automatically if you should accidentally enter the wrong number from the Menu. A similar system is used in the Print program.

I hope that some of the ideas here will be of help to others who have similar specialized program needs. It would be quite easy to change the formats of this program for other cataloging applications. ■

Program Listing 2 continued

```
 79 IFA$="3"THEN200
 80 IFA$="4"THEN2
 85 GOTO76
100 CLS: OPEN"R",1,"PFILE1:1":OPEN"R",2,"PFILE2:1"
102 IF LOF(1)=0 INPUT"NEW FILE - PRESS 'ENTER' TO CONTINUE";X
104 GOSUB9190
105 GOSUB9160:GOSUB252:GOSUB125
107 GOSUB9300:GOSUB9100:GOSUB9000:PUT1,PR
108 GOSUB165
110 GOSUB515:GOTO190
125 CLS:PRINT@25,"ADD TO PARTS LIST
126 PRINT"------------------------------------------------------
----------
127 P$=X$:PRINT
128 PRINT"PART NUMBER ";P$
130 LINEINPUT"FACTORY NUMBER ";G$
132 LINEINPUT"DESCRIPTION ";Z$:GOSUB10000:D$=Z1$
134 LINEINPUT"NOTES ";Z$:GOSUB10000:M$=Z1$
160 RETURN
165 REM
166 GOSUB9180:INPUT"FACTORY NUMBER ";Z$:GOSUB10000:F1$=Z1$
167 LINEINPUT"YEAR & NOTES ";Z$:GOSUB10000:N1$=Z1$
170 GOSUB9110:GOSUB9010:PUT2,LR
180 RETURN
190 GOSUB9310:A$="":PRINT@896,"ANOTHER PART NUMBER? (ENT/N)"
191 A$=INKEY$:IFA$=""THEN191
192 IFA$="N"THEN10
193 IFA$=CHR$(13)THEN105
194 GOTO191
200 CLS:A$="":PRINT"PRINT FILE? (Y/ENT)"
201 A$=INKEY$:IFA$=""THEN201
202 IFA$="Y"THENRUN"PRINT"
203 IFA$=CHR$(13)THEN10
204 GOTO201
250 OPEN"R",1,"PFILE1:1":OPEN"R",2,"PFILE2:1"
252 CLS:X$="":INPUT"ENTER PART NUMBER ('ENTER' TO ESCAPE)";X$:IF
X$=""THEN10
254 X1$=MID$(X$,3,2):LR=VAL(X1$)+1
255 IFC2=1THEN260
256 GOSUB9300:GOSUB9100:GET1,PR
257 RETURN
260 IF LR>50THENLR=LR-50
262 GOTO256
300 IFA$="1"THEN325
301 IFA$="2"THEN631
302 IFA$="3"THEN632
303 IFA$="4"THEN633
304 IFA$="5"THEN634
305 IFA$="6"THEN635
306 IFA$="7"THEN636
307 IFA$="8"THEN638
308 IFA$="9"THEN639
309 GOTO626
325 A$="":PRINT@832,"IF OVER 9 ENTER 2ND NUMBER ELSE 'ENTER'"
326 A$=INKEY$:IFA$=""THEN326
327 IFA$=CHR$(13)THEN630
328 IFA$="0"THEN640
329 IFA$="1"THEN641
330 IFA$="2"THEN642
331 IFA$="3"THEN643
332 IFA$="4"THEN644
334 GOTO326
400 PRINTA$:IFA$="2"THEN425
401 IFA$=CHR$(13)THEN570
403 IFA$="N"THEN9600
404 IFA$="X"THENGOSUB570:GOTO406
405 GOTO450
406 IFC9=1THEN1130
407 GOTO10
410 A1$="":A1$=INKEY$:IFA1$=""THEN410
411 IFA1$=CHR$(13)THEN530
412 IFA1$="0"THEN535
413 IFA1$="1"THEN536
414 IFA1$="2"THEN537
415 IFA1$="3"THEN539
416 IFA1$="4"THEN540
417 IFA1$="5"THEN541
418 IFA1$="6"THEN542
419 IFA1$="7"THEN543
420 IFA1$="8"THEN544
421 IFA1$="9"THEN 545
```

Program Listing 2 continues

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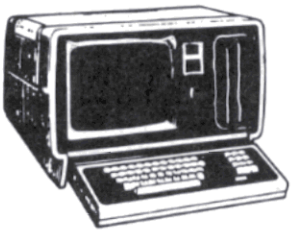

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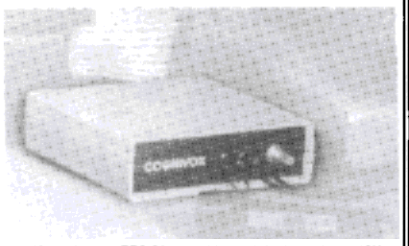

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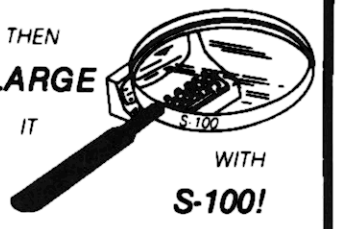

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Program Listing 2 continued

```
422 GOTO410
425 A$="":A$=INKEY$:IFA$=""THEN425
426 IFA$="0"THEN546
427 IFA$="1"THEN547
428 IFA$="2"THEN548
429 IFA$="3"THEN549
430 IFA$="4"THEN550
431 IFA$="5"THEN551
432 IFA$="6"THEN552
433 IFA$="7"THEN553
435 IFA$=CHR$(13)THEN590
436 GOTO425
450 IFA$="1"THEN410
451 IFA$="3"THEN532
452 IFA$="4"THEN533
453 IFA$="5"THEN580
454 IFA$="6"THEN583
455 IFA$="7"THEN4300
456 IFA$="8"THEN525
457 IFA$="9"THEN534
458 GOTO521
460 A$=INKEY$:IFA$=""THEN460
461 IFA$=CHR$(13)THEN527
462 IFA$="Y"THEN9700
463 GOTO460
465 A$=INKEY$:IFA$=""THEN465
466 IFA$=CHR$(13)THEN581
467 IFA$="Y"THEN585
468 GOTO465
470 A$=INKEY$:IFA$=""THEN470
471 IFA$=CHR$(13)THEN1500
472 IFA$="Y"THEN588
473 GOTO470
480 A$=INKEY$:IFA$=""THEN480
481 IFA$="Y"THEN591
482 IFA$=CHR$(13)THEN593
483 GOTO480
500 REM-EDIT PART FILE
502 CLS
505 GOSUB250
506 LS=LR:GOSUB1400:GOSUB510
507 GOTO575
510 GOSUB9196
512 GOSUB9195
515 GOSUB2050
520 PRINT"SELECT NUMBER (N=null, X=end, ENTER=next) ";
521 A$="":A$=INKEY$:IFA$=""THEN521
522 GOTO400
525 A$="":PRINT"CHANGE FILE NUMBER(S) (Y/ENT)":GOTO460
527 GOSUB572:C9=1:GOTO1100
530 LINEINPUT"PART # ";P$:LSETPP$=P$:GOTO560
532 LINEINPUT"DESCRIPTION ";Z$:GOSUB10000:D$=Z1$:LSETDP$=D$:GOTO
560
533 LINEINPUT"NOTES ";Z$:GOSUB10000:M$=Z1$:LSETMP$=M$:GOTO560
534 INPUT"1909";O:LSET O$=MKS$(O):GOTO560
535 INPUT"1910";T:LSETT$=MKS$(T):GOTO560
536 INPUT"1911";T1:LSETT1$=MKS$(T1):GOTO560
537 INPUT"1912";T2:LSETT2$=MKS$(T2):GOTO560
539 INPUT"1913";T3:LSETT3$=MKS$(T3):GOTO560
540 INPUT"1914";T4:LSETT4$=MKS$(T4):GOTO560
541 INPUT"1915";T5:LSETT5$=MKS$(T5):GOTO560
542 INPUT"1916";T6:LSETT6$=MKS$(T6):GOTO560
543 INPUT"1917";T7:LSETT7$=MKS$(T7):GOTO560
544 INPUT"1918";T8:LSETT8$=MKS$(T8):GOTO560
545 INPUT"1919";T9:LSETT9$=MKS$(T9):GOTO560
546 INPUT"1920";W:LSETW$=MKS$(W):GOTO560
547 INPUT"1921";W1:LSETW1$=MKS$(W1):GOTO560
548 INPUT"1922";W2:LSETW2$=MKS$(W2):GOTO560
549 INPUT"1923";W3:LSETW3$=MKS$(W3):GOTO560
550 INPUT"1924";W4:LSETW4$=MKS$(W4):GOTO560
551 INPUT"1925";W5:LSETW5$=MKS$(W5):GOTO560
552 INPUT"1926";W6:LSETW6$=MKS$(W6):GOTO560
553 INPUT"1927";W7:LSETW7$=MKS$(W7)
560 CLS:GOSUB2050
565 GOTO520
570 REM
572 GOSUB9300:GOSUB9100:GOSUB9004:PUT1,PR
573 GOSUB9165:RETURN
575 IFC=1THEN578
577 CLOSE:GOTO500
578 CLS:IFLR=Z1THEN10
579 Z=LR+1:GOTO1803
580 A$="":GOSUB9310:PRINT@896,"CHANGE NOTEFILE A(1) NUMBER? (Y/E
NT)":GOTO465
581 IFR1=0THEN700
582 GOTO800
583 A$="":GOSUB9310:PRINT@896,"CHANGE NOTEFILE A(2) NUMBER? (Y/E
NT)":GOTO470
585 INPUT"NEW NOTEFILE A(1) NUMBER";R1:GOTO515
588 INPUT"NEW NOTEFILE A(2) #";R2:GOTO515
```

Program Listing 2 continues

Program Listing 2 continued

```
590 A$="":PRINT"CHANGE FACTORY NUMBER (Y/ENT)":GOTO480
591 LINEINPUT"FACTORY: ";B$
592 LSETGP$=B$:GOTO560
593 GOSUB9300:GOSUB9100:PUT1,PR
594 GOSUB610:GOSUB615
596 CLS:GOSUB9300:GOSUB9100:GET1,PR
597 GOTO515
600 REM-EDIT FACTORY FILE
610 CLS:PRINT@4,"---------- EDIT FACTORY NUMBER FILE ----------"
611 GOSUB1035
612 RETURN
615 REM
620 GOSUB3000
625 A$="":PRINT@832,"CHANGE? (# OR 'ENTER' ('N' TO NULL))"
626 A$=INKEY$:IFA$=""THEN626
627 IFA$=CHR$(13)THEN672
628 IFA$="N"THEN650ELSE300
630 LINEINPUT"<1>";Z$:GOSUB10000:F1$=Z1$:LSETFA$=F1$:GOTO638
631 LINEINPUT"<2>";Z$:GOSUB10000:F2$=Z1$:LSETFB$=F2$:GOTO639
632 LINEINPUT"<3>";Z$:GOSUB10000:F3$=Z1$:LSETFC$=F3$:GOTO640
633 LINEINPUT"<4>";Z$:GOSUB10000:F4$=Z1$:LSETFD$=F4$:GOTO641
634 LINEINPUT"<5>";Z$:GOSUB10000:F5$=Z1$:LSETFE$=F5$:GOTO642
635 LINEINPUT"<6>";Z$:GOSUB10000:F6$=Z1$:LSETFF$=F6$:GOTO643
636 LINEINPUT"<7>";Z$:GOSUB10000:F7$=Z1$:LSETFG$=F7$:GOTO644
638 LINEINPUT"<8> ";Z$:GOSUB10000:N1$=Z1$:LSETNA$=N1$:GOTO670
639 LINEINPUT"<9> ";Z$:GOSUB10000:N2$=Z1$:LSETNB$=N2$:GOTO670
640 LINEINPUT"<10> ";Z$:GOSUB10000:N3$=Z1$:LSETNC$=N3$:GOTO670
641 LINEINPUT"<11> ";Z$:GOSUB10000:N4$=Z1$:LSETND$=N4$:GOTO670
642 LINEINPUT"<12> ";Z$:GOSUB10000:N5$=Z1$:LSETNE$=N5$:GOTO670
643 LINEINPUT"<13> ";Z$:GOSUB10000:N6$=Z1$:LSETNF$=N6$:GOTO670
644 LINEINPUT"<14> ";Z$:GOSUB10000:N7$=Z1$:LSETNG$=N7$:GOTO670
650 PRINT"NULL FILE? (Y/ENT)"
651 A$=INKEY$:IFA$=""THEN651
652 IFA$="Y"THENGOSUB9606:GOTO670
653 IFA$=CHR$(13)THEN670
654 GOTO651
670 CLS:GOSUB610:GOSUB3000:GOTO625
672 GOSUB9110:PUT2,LR
674 RETURN
700 REM - NEW NOTE FILE ROUTINE
702 OPEN"R",3,"NOTEFILE:1"
704 PR=LOF(3)+1
705 R1=PR
707 GOSUB710:GOTO515
708 GOSUB9140:GOSUB4205:GOTO712
710 GOSUB9140:GOSUB4210
712 A$="":PRINT"ANOTHER P/N - F/N - YR (Y/ENT)"
713 A$=INKEY$:IFA$=""THEN713
714 IFA$="Y"GOSUB4225
715 IFA$=CHR$(13)THEN718
716 GOTO713
718 CLS:GOSUB4000
722 A$="":PRINT"SAVE FILE? (ENT/N)"
723 A$=INKEY$:IFA$=""THEN723
724 IFA$="N"THENCLOSE3:RETURN
725 IFA$=CHR$(13)THEN728
726 GOTO723
728 GOSUB9130:GOSUB9030:PUT3,PR
730 CLOSE3
740 GOSUB9140:RETURN
800 REM-EDIT NOTE FILE <A>
802 OPEN"R",3,"NOTEFILE:1"
805 PR=R1:GOSUB810
806 GOSUB9140:GOTO515
807 GOSUB9130:GET3,PR:GOSUB9070:GOSUB4151:GOTO816
810 GOSUB9130:GET3,PR:GOSUB9070:GOSUB4150
816 GOSUB4165
820 GOSUB9130:PUT3,PR
825 CLOSE3
826 RETURN
850 REM-PRINT 2ND NOTEFILE <B>
852 CLS:OPEN"R",4,"NFILE2:1"
854 PR=R3:GOSUB9150:GET4,PR
856 GOSUB4500
858 PRINT TAB(15) "* * * * * NOTES * * * * *"
860 GOSUB4525:CLOSE4
862 INPUT"HIT 'ENTER' TO RETURN TO PART FILE";X
864 GOTO770
1000 CLS
1005 PRINT"---------- PARTS FILE ----------
-"
1035 PRINT"PART # ";PP$;TAB(20)"FACT. # ";GP$;TAB(40);DP$
1036 PRINT"NOTES: ";MP$
1037 GOSUB9170
1040 RETURN
1100 CLS:P1$=LEFT$(PP$,4)
1102 CLS:P3$="":INPUT"PART # (IF ALL OF SAME # HIT 'ENTER')";P3$
:IFP3$=""THEN1230
1103 IFVAL(P1$)<>VAL(P3$)THEN1102
1104 IFR4=0THEN1118
```

Program Listing 2 continues

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Program Listing 2 continued

```
1105 A=R4:GOSUB1109:A=R5:GOSUB1109:A=R6:GOSUB1109:A=R7:GOSUB1109
:A=R8:GOSUB1109:A=R9:GOSUB1109:A=S1:GOSUB1109:A=S2:GOSUB1109
1106 A=S3:GOSUB1109:A=S4:GOSUB1109:A=S5:GOSUB1109:A=S6:GOSUB1109
:A=S7:GOSUB1109:A=S8:GOSUB1109:A=S9:GOSUB1109:GOTO1118
1109 IFA=0PRINT"END OF ";P1$;" FILES":GOTO1119
1110 IFC2=1THENLR=A+50ELSELR=A+100
1111 GOSUB9165:GOSUB9300:GOSUB9100:GET1,PR
1112 X=LEN(P3$):X$=LEFT$(PP$,X)
1114 IF P3$=X$THEN1140
1116 RETURN
1118 CLS:PRINT"PART NUMBER NOT IN AUXILLARY FILE"
1119 PRINT:IFS9>0INPUT"AUXILLARY FILES FULL - HIT 'ENTER' FOR MA
IN FILE";X:GOTO1132
1120 A$="":PRINT@128,"ENTER NEW AUXILLARY PART FILE? (Y/N)"
1121 A$=INKEY$:IFA$=""THEN1121
1122 IFA$="Y"THEN1124
1123 IFA$="N"THEN1132ELSE1121
1124 GOSUB9200:IFLR<100THENLR=100
1125 LR=LR+1:GOSUB9165:GOSUB9300:GOSUB9100:GET1,PR
1126 GOSUB9160:X$=P3$:GOSUB125
1127 GOSUB9100:GOSUB9000:PUT1,PR
1128 GOSUB9500:GOSUB165:GOSUB515
1130 C9=0:X$=P1$
1132 GOSUB254:GOSUB1300
1134 GOSUB512
1137 GOTO575
1140 GOSUB1400:GOSUB512
1142 GOTO1102
1190 GOTO1195
1191 IFR4>0THENPRINT@192,"<8> AUX.";R4;"/";R5;"/";R6;"/";R7;"/";
R8
1192 IFR9>0THENPRINT@264,R9;"/";S1;"/";S2;"/";S3;"/";S4;"  ";S5;
"/";S6;"/";S7;"/";S8;"/";S9
1193 RETURN
1195 IFC2=1THEN1198
1196 IFLR>100RETURN
1197 GOTO1191
1198 IFLR>50RETURN
1199 GOTO1191
1230 CLS:P1$=LEFT$(PP$,4)
1232 A=R4:GOSUB1234:A=R5:GOSUB1234:A=R6:GOSUB1234:A=R7:GOSUB1234
:A=R8:GOSUB1234:A=R9:GOSUB1234:A=S1:GOSUB1234:A=S2:GOSUB1234:A=S
3:GOSUB1234:A=S4:GOSUB1234:A=S5:GOSUB1234:A=S6:GOSUB1234:A=S7:GO
SUB1234:A=S8:GOSUB1234:A=S9:GOSUB1234:GOTO1242
1234 IFA=0THEN1244
1235 IFC2=1THENLR=A+50ELSELR=A+100
1236 GOSUB9165:GOSUB9300:GOSUB9100:GET1,PR
1240 GOTO1250
1242 IFS9>0INPUT"AUXILLARY FILE FULL - HIT 'ENTER' FOR MAIN FILE
";X:GOTO1132
1244 CLS:PRINT"NO MORE ";P1$;"'S IN FILE"
1245 A$="":PRINT@128,"ENTER NEW NUMBER? (Y/N)"
1246 A$=INKEY$:IFA$=""THEN1246
1247 IFA$="Y"THEN1275
1248 IFA$="N"THEN1130ELSE1246
1250 GOSUB1400:GOSUB512
1252 RETURN
1275 CLS:INPUT"ENTER NEW PART NUMBER";P3$:GOTO1124
1300 GOSUB9180:GOSUB9110:GET2,LR
1302 GOSUB9012:PUT2,LR:RETURN
1400 GOSUB9110:GET2,LR:RETURN
1502 GOSUB9140:OPEN"R",3,"NOTEFILE:1"
1505 IFR2=0THEN1550
1508 PR=R2:GOSUB807
1510 GOTO515
1550 PR=LOF(3)+1
1552 R2=PR
1555 GOSUB710
1560 GOTO515
1800 REM - SEQUENTIAL EDIT ROUTINE
1802 OPEN"R",1,"PFILE1:1":OPEN"R",2,"PFILE2:1":GOSUB9200
1803 FOR LR=ZTOZ1
1804 GOSUB9300:GOSUB9100:GET1,PR
1805 IF VAL(PP$)<1GOTO1815
1808 GOSUB1400:GOSUB510
1815 NEXT LR
1816 GOTO10
1820 C=0:CLS:A$="":PRINT"SEQUENTIAL OR INDIVIDUAL EDIT? (S/ENT)"
1821 A$=INKEY$:IFA$=""THEN1821
1822 IFA$="S"THENC=1:GOTO1840
1823 IFA$=CHR$(13)THEN500
1825 GOTO1821
1840 INPUT"BEGINNING PART NUMBER";Z$:Z1$=MID$(Z$,3,2):Z=VAL(Z1$)
+1
1842 INPUT"ENDING PART NUMBER";ZA$:ZB$=MID$(ZA$,3,2):Z1=VAL(ZB$)
+1
1843 IFC2=1THEN1850
1845 GOTO1800
```

Program Listing 2 continues

NEW !!
NOW FOR MOD III

SUPER UTILITY PLUS

— OVERVIEW —

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SUPER UTILITY PLUS was written by Kim Watt of Breeze Computing, Inc. and is the most powerful program of its kind on the market at this time. This program is a machine language, stand alone program that has its own I/O routines, does not use any ROM or DOS calls, and works on SINGLE or DOUBLE DENSITY systems. SUPER UTILITY PLUS performs such a wide range of varied tasks, that it may truly be called "The King of Utilities". It is not required that the disk be in any drive after initialization of the program and user may custom configure the program to suit his individual system requirements.

ZAP does everything your present "zapping" utility does plus many additional enhancements. It will operate on SINGLE or DOUBLE DENSITY systems and will work with most major operating systems that are presently on the market. It has dual cursors (one for ASCII and one for HEX side of the readout) and allows the user to go to the heart of the disk and read and/or modify data in HEX, ASCII, DECIMAL, BINARY, or OCTAL, regardless of whether it is a standard disk or not. The screen printout on Zap displays one sector at a time in HEX and ASCII (as other "zapping" utilities), but also tells user the true and relative track and whether the disk is IBM format or not. Zap also has a search routine that will locate the highest or lowest configured track on the disk and others that will search the disk for a byte list, ASCII string, word list, or even encripted code. Zap also allows you to display disk sectors, compare disk sectors, copy sector data, zero disk sectors, copy disk sectors, reverse sector data, sector searches, read ID address marks, or alter data address marks.

PURGE has a full screen editing kill control that allows you to kill files by positioning cursor and pressing one key. Also, Purge has several sub-utilities that allow you to zero out unused directory entries or zero out unused disk granules. In addition, user may kill files by naming the common category of the files (Example: /CMD/BAS/TXT <I>nvisible, <V>isible, etc. or even kill files that begin with a specified letter), and also may compute existing passwords, change the disk name, date, passwords, auto command, or even file parameters (name, passwords, protection levels). Lastly, Purge contains a complete disk directory that indicates all active and non-active files on the disk.

FORMAT is a utility that allows the user to format a disk with; standard format, format without erasing existing data, special format (custom format your disk most any way you want it), build a format track and optionally write it back to any track on your disk, and even contains a software bulk erase utility. The total formatting capabilities of this program are just about UNLIMITED and you may even reformat over a disk or add tracks to an existing disk without destroying existing disk data.

DISK COPY will copy most any standard disk, with or without formatting. The Special Disk Copy enables the user to make a backup of most TRS-80® readable disks that are presently on the market, regardless of any efforts that have been made to protect them from being "backed up". (NOTE: This program WILL NOT copy itself). This program's only intended use is for you to make backups of your legally purchased programs. Please DO NOT use this utility to make "bootleg copies" for others as authors of quality programs deserve their royalities.

TAPE COPY enables the user to perform a wide variety of actions that include the ability to read, write, or verify tapes and even includes a Bit by Bit copying routine that will back up most ANY TRS-80® readable tape regardless of protection attempts made by authors. This utility also is for your own use only.

DISK REPAIR allows you to automatically repair the HIT and GAT sectors, and will automatically repair a Boot. This utility also does a complete Directory Check and will advise you of errors that exist. In addition, this utility allows the user to recover killed files (if the file was killed by this utility or by NEWDOS), read protect or un-read protect the directory, move it to a different location on the disk, or clear unused entries. Lastly, this utility advises you of all inactive files that are on the disk.

MEMORY supplies the ability to display, move, test, compare, zero, exchange, input or output a byte to any port, exchange, jump to, reverse, fill, string search, or even load/write and entire track or sectors to/from memory.

FILE contains the abilities to display file sectors, compare files, copy files, disk directory, free space, file locations, drive status, create files, and clear files from disk. These utilities give you a wide range of powerful commands at your disposal to perform just about any function that you want with files up and including the complete reorganization of your entire disk with all the files re-written in their most contigious order.

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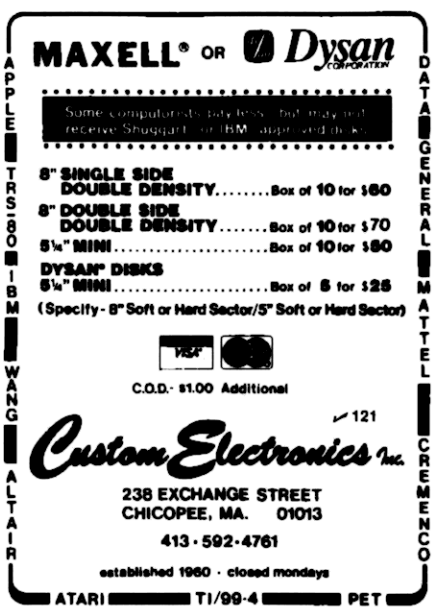

Program Listing 2 continued

```
1850 IFZ>50THENZ=Z-50:Z1=Z1-50
1852 GOTO1800
2050 REM - PRINT PART/PRICE ROUTINE
2051 CLS:PRINT@4,"---------- EDIT PARTS/PRICE FILE----------"
2053 PRINT"<1> PART # ";PP$;TAB(20)"<2> FACT # ";GP$;TAB(40)"<3>
 ";DP$
2054 PRINT"<4> NOTES: ";MP$;TAB(35)"<5> NOTEFILE(A)";R1;",<6> ";
R2
2055 PRINT TAB(35)"<7> NOTEFILE(B)";R3
2056 GOSUB2190
2058 GOSUB2105
2060 PRINT"1909";TAB(12)"1913";TAB(24)"1917";TAB(36)"1921";TAB(4
8)"1925"
2061 PRINT"<9> ";O;TAB(12)"<13>";T3;TAB(24)"<17>";T7;TAB(36)"<21
>";W1;TAB(48)"<25>";W5
2062 PRINT"1910";TAB(12)"1914";TAB(24)"1918";TAB(36)"1922";TAB(4
8)"1926"
2063 PRINT"<10>";T;TAB(12)"<14>";T4;TAB(24)"<18>";T8;TAB(36)"<22
>";W2;TAB(48)"<26>";W6
2064 PRINT"1911";TAB(12)"1915";TAB(24)"1919";TAB(36)"1923";TAB(4
8)"1927"
2065 PRINT"<11>";T1;TAB(12)"<15>";T5;TAB(24)"<19>";T9;TAB(36)"<2
3>";W3;TAB(48)"<27>";W7
2066 PRINT"1912";TAB(12)"1916";TAB(24)"1920";TAB(36)"1924"
2067 PRINT"<12>";T2;TAB(12)"<16>";T6;TAB(24)"<20>";W;TAB(36)"<24
>";W4
2070 RETURN
2105 PRINT"---------------------- PRICES ----------------------"

2110 GOSUB9050
2115 RETURN
3000 REM-EDIT FACTORY FILE ROUTINE
3005 PRINT:PRINT"FACT #","CATALOG YEAR/NOTES"
3010 PRINT"<1> ";FA$,"< 8> ";NA$
3011 PRINT"<2> ";FB$,"< 9> ";NB$
3012 PRINT"<3> ";FC$,"<10> ";NC$
3013 PRINT"<4> ";FD$,"<11> ";ND$
3014 PRINT"<5> ";FE$,"<12> ";NE$
3015 PRINT"<6> ";FF$,"<13> ";NF$
3016 PRINT"<7> ";FG$,"<14> ";NG$
3025 RETURN
4000 CLS:PRINT"---------NOTE FILE (";R1;") FOR PART # ";PP$;" --
--------"
4005 GOSUB1035
4006 IFR3>0THEN4010
4007 PRINT
4010 PRINT"PART #","FACT #","YEAR INTRODUCED"
4015 PRINT"<1> (1)";EA$;TAB(20)"(6)";HA$;TAB(40)"(11)";J1
4017 PRINT"<2> (2)";EB$;TAB(20)"(7)";HB$;TAB(40)"(12)";J2
4020 PRINT"<3> (3)";EC$;TAB(20)"(8)";HC$;TAB(40)"(13)";J3
4022 PRINT"<4> (4)";ED$;TAB(20)"(9)";HD$;TAB(40)"(14)";J4
4024 PRINT"<5> (5)";EE$;TAB(20)"(10)";HE$;TAB(40)"(15)";J5
4026 PRINT"(16)NOTES: ";MB$
4028 PRINT"(17)NOTES: ";MC$
4030 PRINT"(18)NOTES: ";MD$
4040 RETURN
4100 IFA$="1"THEN4125
4101 IFA$="2"THEN4173
4102 IFA$="3"THEN4176
4103 IFA$="4"THEN4179
4104 IFA$="5"THEN4182
4105 IFA$="6"THEN4171
4106 IFA$="7"THEN4174
4107 IFA$="8"THEN4177
4108 IFA$="9"THEN4180
4109 GOTO4166
4125 A$="":PRINT@896,"IF OVER 9 ENTER 2ND NUMBER ELSE 'ENTER'"
4126 A$=INKEY$:IFA$=""THEN4126
4127 IFA$=CHR$(13)THEN4170
4128 IFA$="0"THEN4183
4129 IFA$="1"THEN4172
4130 IFA$="2"THEN4175
4131 IFA$="3"THEN4178
4132 IFA$="4"THEN4181
4133 IFA$="5"THEN4184
4134 IFA$="6"THEN4185
4135 IFA$="7"THEN4186
4136 IFA$="8"THEN4187
4137 GOTO4126
4150 CLS:PRINT"------------ NOTE FILE # ";R1;" FOR PART # ";PP$;
" ------------":GOSUB1035:GOTO4152
4151 CLS:PRINT"------------ NOTE FILE # ";R2;" FOR PART # ";PP$;
"------------":GOSUB1035
4152 IFR3>0THEN4153ELSEPRINT
4153 PRINT"PART #","FACT #","YEAR INTRODUCED"
4155 PRINT"<1> (1)";E1$;TAB(20)"(6)";H1$;TAB(40)"(11)";J1
4156 PRINT"<2> (2)";E2$;TAB(20)"(7)";H2$;TAB(40)"(12)";J2
4157 PRINT"<3> (3)";E3$;TAB(20)"(8)";H3$;TAB(40)"(13)";J3
4158 PRINT"<4> (4)";E4$;TAB(20)"(9)";H4$;TAB(40)"(14)";J4
4159 PRINT"<5> (5)";E5$;TAB(20)"(10)";H5$;TAB(40)"(15)";J5
```

Program Listing 2 continues

Program Listing 2 continued

```
4160 PRINT"(16)NOTES: ";M2$
4161 PRINT"(17)NOTES: ";M3$
4162 PRINT"(18)NOTES: ";M4$
4163 RETURN
4165 A$="":PRINT@896,"CHANGE? (# OR 'ENTER')"
4166 A$=INKEY$:IFA$=""THEN4166
4167 IFA$=CHR$(13)THENRETURN
4168 GOTO4100
4170 INPUT"(1) PART #";EA$:LSETE1$=EA$
4171 INPUT"(6) FACT #";HA$:LSETH1$=HA$
4172 INPUT"(11) YEAR";J1:LSETJ1$=MKI$(J1):GOTO4190
4173 INPUT"(2) PART #";EB$:LSETE2$=EB$
4174 INPUT"(7) FACT #";HB$:LSETH2$=HB$
4175 INPUT"(12) YEAR";J2:LSETJ2$=MKI$(J2):GOTO4190
4176 INPUT"(3) PART #";EC$:LSETE3$=EC$
4177 INPUT"(8) FACT #";HC$:LSETH3$=HC$
4178 INPUT"(13) YEAR";J3:LSETJ3$=MKI$(J3):GOTO4190
4179 INPUT"(4) PART #";ED$:LSETE4$=ED$
4180 INPUT"(9) FACT #";HD$:LSETH4$=HD$
4181 INPUT"(14) YEAR";J4:LSETJ4$=MKI$(J4):GOTO4190
4182 INPUT"(5) PART #";EE$:LSETE5$=EE$
4183 INPUT"(10) FACT #";HE$:LSETH5$=HE$
4184 INPUT"(15) YEAR";J5:LSETJ5$=MKI$(J5):GOTO4190
4185 LINEINPUT"(16) NOTES: ";Z$:GOSUB10000:MB$=Z1$:LSETM2$=MB$:G
OTO4190
4186 LINEINPUT"(17) NOTES: ";Z$:GOSUB10000:MC$=Z1$:LSETM3$=MC$:G
OTO4190
4187 LINEINPUT"(18) NOTES: ";Z$:GOSUB10000:MD$=Z1$:LSETM4$=MD$
4190 CLS:GOSUB4150:GOTO4165
4200 REM-INPUT NOTE FILE
4205 CLS:PRINT"--------- NOTE FILE # ";R1;" FOR PART # ";PP$;" -
-------":GOTO4212
4210 CLS:PRINT"--------- NOTE FILE # ";R2;" FOR PART # ";PP$;"
---------"
4212 GOSUB1035
4213 PRINT
4214 INPUT"PART NUMBER";EA$:LSETE1$=EA$
4215 INPUT"FACTORY NUMBER";HA$:LSETH1$=HA$
4216 INPUT"YEAR 1ST USED";J1:LSETJ1$=MKI$(J1)
4217 LINEINPUT"NOTES: ";Z$:GOSUB10000:MB$=Z1$:LSETM2$=MB$
4218 LINEINPUT"NOTES: ";Z$:GOSUB10000:MC$=Z1$:LSETM3$=MC$
4219 LINEINPUT"NOTES: ";Z$:GOSUB10000:MD$=Z1$:LSETM4$=MD$
4220 RETURN
4225 INPUT"PART #";EB$:LSETE2$=EB$
4226 INPUT"FACT #";HB$:LSETH2$=HB$
4227 INPUT"YEAR 1ST USED";J2:LSETJ2$=MKI$(J2)
4228 X$="":INPUT"ANOTHER? (Y/ENT)";X$:IFX$="Y"THEN4230
4229 GOTO4250
4230 INPUT"PART #";EC$:LSETE3$=EC$
4231 INPUT"FACT #";HC$:LSETH3$=HC$
4232 INPUT"YEAR 1ST USED";J3:LSETJ3$=MKI$(J3)
4233 X$="":INPUT"ANOTHER? (Y/ENT)";X$:IFX$="Y"THEN4235
4234 GOTO4250
4235 INPUT"PART #";ED$:LSETE4$=ED$
4236 INPUT"FACT #";HD$:LSETH4$=HD$
4237 INPUT"YEAR 1ST USED";J4:LSETJ4$=MKI$(J4)
4238 X$="":INPUT"ANOTHER? (Y/ENT)";X$:IFX$="Y"THEN4240
4239 GOTO4250
4240 INPUT"PART #";EE$:LSETE5$=EE$
4241 INPUT"FACT #";HE$:LSETH5$=HE$
4242 INPUT"YEAR 1ST USED";J5:LSETJ5$=MKI$(J5)
4250 RETURN
4300 REM - NOTEFILE (B) ROUTINE
4305 PRINT"CHANGE NOTEFILE (B) NUMBER? (Y/ENT)"
4306 A$=INKEY$:IFA$=""THEN4306
4307 IFA$="Y"THEN4312
4308 IFA$=CHR$(13)THEN4320
4310 GOTO4306
4312 INPUT"NEW NOTEFILE (B) NUMBER";R3
4314 GOTO515
4320 IFR3=0THEN4350
4322 GOTO4400
4350 REM - INPUT NEW 2ND NOTE FILE
4353 CLS:OPEN"R",4,"NFILE2:1"
4356 PR=LOF(4)+1
4360 R3=PR
4365 GOSUB4500
4370 LINEINPUT"NOTE 1: ";Z$:GOSUB10000:ME$=Z1$:LSETM5$=ME$
4371 LINEINPUT"NOTE 2: ";Z$:GOSUB10000:MF$=Z1$:LSETM6$=MF$
4372 LINEINPUT"NOTE 3: ";Z$:GOSUB10000:MG$=Z1$:LSETM7$=MG$
4373 LINEINPUT"NOTE 4: ";Z$:GOSUB10000:MH$=Z1$:LSETM8$=MH$
4374 LINEINPUT"NOTE 5: ";Z$:GOSUB10000:MI$=Z1$:LSETM9$=MI$
4376 GOSUB4500:GOSUB4550
4382 A$="":PRINT@896,"SAVE FILE? (Y/N)"
4383 A$=INKEY$:IFA$=""THEN4383
4384 IFA$="Y"THEN4386
4385 IFA$="N"THEN4390ELSE4383
4386 GOSUB9150:GOSUB9060:PUT4,PR
4390 CLOSE4:GOTO515
4400 REM - EDIT 2ND NOTEFILE
```

Program Listing 2 continues

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Program Listing 2 continued

```
4410 CLS:OPEN"R",4,"NFILE2:1"
4412 PR=R3:GOSUB9150:GET4,PR
4420 CLS:GOSUB4500
4424 GOSUB4522
4426 GOTO4460
4450 LINEINPUT"NOTE 1: ";Z$:GOSUB10000:ME$=Z1$:LSETM5$=ME$:GOTO4
420
4451 LINEINPUT"NOTE 2: ";Z$:GOSUB10000:MF$=Z1$:LSETM6$=MF$:GOTO4
420
4452 LINEINPUT"NOTE 3: ";Z$:GOSUB10000:MG$=Z1$:LSETM7$=MG$:GOTO4
420
4453 LINEINPUT"NOTE 4: ";Z$:GOSUB10000:MH$=Z1$:LSETM8$=MH$:GOTO4
420
4454 LINEINPUT"NOTE 5: ";Z$:GOSUB10000:MI$=Z1$:LSETM9$=MI$:GOTO4
420
4460 A$="":PRINT@896,"CHANGE? (# OR 'ENTER')"
4461 A$=INKEY$:IFA$=""THEN4461
4462 IFA$="1"THEN4450
4463 IFA$="2"THEN4451
4464 IFA$="3"THEN4452
4465 IFA$="4"THEN4453
4466 IFA$="5"THEN4454
4467 IFA$=CHR$(13)THEN4472
4468 GOTO4461
4472 GOSUB9150:PUT4,PR
4480 CLOSE4:GOTO515
4500 CLS:PRINT@10,"NOTEFILE B # ";R3;" FOR P/N ";PP$
4505 GOSUB1035
4515 PRINT
4520 RETURN
4522 PRINT"     ------------------- NOTES -------------------"
4523 PRINT
4525 PRINT"<1> ";M5$
4526 PRINT"<2> ";M6$
4527 PRINT"<3> ";M7$
4528 PRINT"<4> ";M8$
4529 PRINT"<5> ";M9$
4530 PRINT:RETURN
4550 PRINT"     -------------------- NOTES --------------------":
PRINT
4554 PRINT"<1> ";ME$
4555 PRINT"<2> ";MF$
4556 PRINT"<3> ";MG$
4557 PRINT"<4> ";MH$
4558 PRINT"<5> ";MI$
4559 PRINT:PRINT
4560 RETURN
9000 LSETO$=MKS$(O):LSETT$=MKS$(T):LSETT1$=MKS$(T1):LSETT2$=MKS$
(T2):LSETT3$=MKS$(T3):LSETT4$=MKS$(T4):LSETT5$=MKS$(T5):LSETT6$=
MKS$(T6):LSETT7$=MKS$(T7):LSETT8$=MKS$(T8):LSETT9$=MKS$(T9)
9002 LSETW$=MKS$(W):LSETW1$=MKS$(W1):LSETW2$=MKS$(W2):LSETW3$=MK
S$(W3):LSETW4$=MKS$(W4):LSETW5$=MKS$(W5):LSETW6$=MKS$(W6):LSETW7
$=MKS$(W7)
9003 LSETPP$=P$:LSETGP$=G$:LSETDP$=D$:LSETMP$=M$
9004 LSETR1$=MKI$(R1):LSETR2$=MKI$(R2):LSETR3$=MKI$(R3)
9005 RETURN
9010 LSET FA$=F1$:LSET FB$=F2$:LSETFC$=F3$:LSETFD$=F4$:LSETFE$=F
5$:LSETFF$=F6$:LSETFG$=F7$:LSETNA$=N1$:LSETNB$=N2$:LSETNC$=N3$:L
SETND$=N4$:LSETNE$=N5$:LSETNF$=N6$:LSETNG$=N7$
9012 LSETR4$=MKI$(R4):LSETR5$=MKI$(R5):LSETR6$=MKI$(R6):LSETR7$=
MKI$(R7):LSETR8$=MKI$(R8):LSETR9$=MKI$(R9)
9013 LSETS1$=MKI$(S1):LSETS2$=MKI$(S2):LSETS3$=MKI$(S3):LSETS4$=
MKI$(S4):LSETS5$=MKI$(S5):LSETS6$=MKI$(S6):LSETS7$=MKI$(S7):LSET
S8$=MKI$(S8):LSETS9$=MKI$(S9)
9015 RETURN
9030 LSETE1$=EA$:LSETE2$=EB$:LSETE3$=EC$:LSETE4$=ED$:LSETE5$=EE$
:LSETH1$=HA$:LSETH2$=HB$:LSETH3$=HC$:LSETH4$=HD$:LSETH5$=HE$
9031 LSETM2$=MB$:LSETM3$=MC$:LSETM4$=MD$
9032 LSETJ1$=MKI$(J1):LSETJ2$=MKI$(J2):LSETJ3$=MKI$(J3):LSETJ4$=
MKI$(J4):LSETJ5$=MKI$(J5)
9035 RETURN
9040 P$=PP$:G$=GP$:D$=DP$:M$=MP$:R1=CVI(R1$):R2=CVI(R2$):R3=CVI(
R3$)
9042 RETURN
9050 O=CVS(O$):T=CVS(T$):T1=CVS(T1$):T2=CVS(T2$):T3=CVS(T3$):T4=
CVS(T4$):T5=CVS(T5$):T6=CVS(T6$):T7=CVS(T7$):T8=CVS(T8$):T9=CVS(
T9$)
9052 W=CVS(W$):W1=CVS(W1$):W2=CVS(W2$):W3=CVS(W3$):W4=CVS(W4$):W
5=CVS(W5$):W6=CVS(W6$):W7=CVS(W7$)
9055 RETURN
9060 LSETM5$=ME$:LSETM6$=MF$:LSETM7$=MG$:LSETM8$=MH$:LSETM9$=MI$

9065 RETURN
9070 J1=CVI(J1$):J2=CVI(J2$):J3=CVI(J3$):J4=CVI(J4$):J5=CVI(J5$)

9080 IFJ1<1THENJ1=0:IFJ2<1THENJ2=0:IFJ3<0THENJ3=0:IFJ4<1THENJ4=0
:IFJ5<1THENJ5=0
9081 RETURN
9090 ME$=M5$:MF$=M6$:MG$=M7$:MH$=M8$:MI$=M9$
9095 RETURN
```

Program Listing 2 continues

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Program Listing 2 continued

```
9100 FIELD1,SR*126ASD2$,8ASPP$,8ASGP$,2ASR1$,2ASR2$,2ASR3$,14ASD
P$,14ASMP$,4ASO$,4AST$,4AST1$,4AST2$,4AST3$,4AST4$,4AST5$,4AST6$
,4AST7$,4AST8$,4AST9$,4ASW$,4ASW1$,4ASW2$,4ASW3$,4ASW4$,4ASW5$,4
ASW6$,4ASW7$
9105 RETURN
9110 FIELD2,8ASFA$,22ASNA$,8ASFB$,22ASNB$,8ASFC$,22ASNC$,8ASFD$,
22ASND$,8ASFE$,22ASNE$,8ASFF$,22ASNF$,8ASFG$,22ASNG$,2ASR4$,2ASR
5$,2ASR6$,2ASR7$,2ASR8$,2ASR9$,2ASS1$,2ASS2$,2ASS3$,2ASS4$,2ASS5
$,2ASS6$,2ASS7$,2ASS8$,2ASS9$
9120 RETURN
9130 FIELD3,8ASE1$,8ASE2$,8ASE3$,8ASE4$,8ASE5$,8ASH1$,8ASH2$,8AS
H3$,8ASH4$,8ASH5$,2ASJ1$,2ASJ2$,2ASJ3$,2ASJ4$,2ASJ5$,52ASM2$,52A
SM3$,50ASM4$
9135 RETURN
9140 EA$="":EB$="":EC$="":ED$="":EE$="":HA$="":HB$="":HC$="":HD$
="":HE$="":J1=0:J2=0:J3=0:J4=0:J5=0
9141 MB$="":MC$="":MD$=""
9142 E1$="":E2$="":E3$="":E4$="":E5$="":H1$="":H2$="":H3$="":H4$
="":H5$="":J1$="":J2$="":J3$="":J4$="":J5$=""
9143 M2$="":M3$="":M4$=""
9144 RETURN
9150 FIELD 4,50AS M5$,50AS M6$,50AS M7$,50AS M8$,50AS M9$
9155 RETURN
9160 G$="":D$="":M$="":GP$="":DP$="":MP$="":O$="":T$="":T1$="":T
2$="":T3$="":T4$="":T5$="":T6$="":T7$="":T8$="":T9$=""
9161 W$="":W1$="":W2$="":W3$="":W4$="":W5$="":W6$="":W7$=""
9162 O=0:T=0:T1=0:T2=0:T3=0:T4=0:T5=0:T6=0:T7=0:T8=0:T9=0:W=0:W1
=0:W2=0:W3=0:W4=0:W5=0:W6=0:W7=0
9165 R1=0:R2=0:R3=0:RETURN
9170 REM - ADD NOTEFILES
9172 IFR1>0PRINT@158,"NOTEFILE (A) ";R1;",";R2
9173 IF R3>0PRINT@222,"NOTEFILE (B) ";R3
9174 IF R1=0 AND R3=0 PRINT@168,"NO NOTE FILES"
9175 RETURN
9180 F1$="":F2$="":F3$="":F4$="":F5$="":F6$="":F7$="":N1$="":N2$
="":N3$="":N4$="":N5$="":N6$="":N7$=""
9181 FA$="":FB$="":FC$="":FD$="":FE$="":FF$="":FG$="":NA$="":NB$
="":NC$="":ND$="":NE$="":NF$="":NG$=""
9182 RETURN
9190 R1=0:R2=0:R3=0:R4=0:R5=0:R6=0:R7=0:R8=0:R9=0:S1=0:S2=0:S3=0
:S4=0:S5=0:S6=0:S7=0:S8=0:S9=0:RETURN
9195 R1=CVI(R1$):R2=CVI(R2$):R3=CVI(R3$):RETURN
9196 R4=CVI(R4$):R5=CVI(R5$):R6=CVI(R6$):R7=CVI(R7$):R8=CVI(R8$)
:R9=CVI(R9$):S1=CVI(S1$):S2=CVI(S2$):S3=CVI(S3$):S4=CVI(S4$):S5=
CVI(S5$):S6=CVI(S6$):S7=CVI(S7$):S8=CVI(S8$):S9=CVI(S9$)
9197 RETURN
9200 REM - FIND RECORDS
9205 SR=1:PR=LOF(1)
9210 GOSUB9100:GET1,PR
9215 IFPP$<"!"THENLR=PR*2-1ELSELR=PR*2
9218 RETURN
9250 PR=LOF(3)
9252 GOSUB9130:GET3,PR
9260 RETURN
9300 PR=INT((LR-1)/2)+1:SR=LR-2*INT((LR-1)/2)-1
9302 RETURN
9310 PRINT@896,"
      ":RETURN
9500 RA=LR:IFC2=1THEN9503
9502 IFRA>100THENRA=RA-100:GOTO9505
9503 IFRA>50THENRA=RA-50
9505 IFR4=0THENR4=RA:GOTO9520
9506 IFR5=0THENR5=RA:GOTO9520
9507 IFR6=0THENR6=RA:GOTO9520
9508 IFR7=0THENR7=RA:GOTO9520
9509 IFR8=0THENR8=RA:GOTO9520
9510 IFR9=0THENR9=RA:GOTO9520
9511 IFS1=0THENS1=RA:GOTO9520
9512 IFS2=0THENS2=RA:GOTO9520
9513 IFS3=0THENS3=RA:GOTO9520
9514 IFS4=0THENS4=RA:GOTO9520
9515 IFS5=0THENS5=RA:GOTO9520
9516 IFS6=0THENS6=RA:GOTO9520
9517 IFS7=0THENS7=RA:GOTO9520
9518 IFS8=0THENS8=RA:GOTO9520
9519 IFS9=0THENS9=RA
9520 RETURN
9600 PRINT"NULL FILE? (Y/ENT)"
9601 A$=INKEY$:IFA$=""THEN9601
9602 IFA$=CHR$(13)THEN520
9603 IFA$="Y"THEN9604ELSE9601
9604 P$="":G$="":D$="":M$="":O=0:T=0:T1=0:T2=0:T3=0:T4=0:T5=0:T6
=0:T7=0:T8=0:T9=0:W=0:W1=0:W2=0:W3=0:W4=0:W5=0:W6=0:W7=0
9605 GOSUB9000:GOTO560
9606 F1$="":F2$="":F3$="":F4$="":F5$="":F6$="":F7$="":N1$="":N2$
="":N3$="":N4$="":N5$="":N6$="":N7$=""
9608 GOSUB9010:RETURN
9700 PRINT"WHICH SEGMENT? (1-15) <ENTER 16 TO CLEAR>"
9705 GOTO9750
```

Program Listing 2 continues

Program Listing 2 continued

```
9710 INPUT"1ST SEGMENT";R4:GOTO9730
9711 INPUT"2ND SEGMENT";R5:GOTO9730
9712 INPUT"3RD SEGMENT";R6:GOTO9730
9713 INPUT"4TH SEGMENT";R7:GOTO9730
9714 INPUT"5TH SEGMENT";R8:GOTO9730
9715 INPUT"6TH SEGMENT";R9:GOTO9730
9716 INPUT"7TH SEGMENT";S1:GOTO9730
9717 INPUT"8TH SEGMENT";S2:GOTO9730
9718 INPUT"9TH SEGMENT";S3:GOTO9730
9719 INPUT"10TH SEGMENT";S4:GOTO9730
9720 INPUT"11TH SEGMENT";S5:GOTO9730
9721 INPUT"12TH SEGMENT";S6:GOTO9730
9722 INPUT"13TH SEGMENT";S7:GOTO9730
9723 INPUT"14TH SEGMENT";S8:GOTO9730
9724 INPUT"15TH SEGMENT";S9
9730 PRINT"ANOTHER SEGMENT? (Y/ENT)
9731 A$=INKEY$:IFA$=""THEN9731
9732 IFA$="Y"THEN9700
9733 IFA$=CHR$(13)THEN9740
9734 GOTO9731
9740 GOSUB1300:GOTO515
9745 GOSUB9190:GOTO9740
9750 A$=INKEY$:IFA$=""THEN9750
9752 IFA$="1"THEN 9775
9754 IFA$="2"THEN9711
9755 IFA$="3"THEN9712
9756 IFA$="4"THEN9713
9757 IFA$="5"THEN9714
9758 IFA$="6"THEN9715
9759 IFA$="7"THEN9716
9760 IFA$="8"THEN9739
9761 IFA$="9"THEN9718
9762 GOTO9750
9775 A$=INKEY$:IFA$=""THEN9775
9776 IFA$=CHR$(13)THEN9710
9777 IFA$="0"THEN9719
9778 IFA$="1"THEN9720
9779 IFA$="2"THEN9721
9780 IFA$="3"THEN9722
9781 IFA$="4"THEN9723
9782 IFA$="5"THEN9724
9783 IFA$="6"THENGOSUB9190:GOTO9740
9784 GOTO9775
10000 Z1$="":IFZ$=""RETURN
10010 Z=LEN(Z$):FORX=1TOZ
10012 B=ASC(MID$(Z$,X,1)):IFB<65THENA=B:GOTO10020
10014 IFB<91THENA=B+32:GOTO10020
10016 IFB<128THENA=B-32
10020 Z1$=Z1$+CHR$(A)
10022 NEXT:RETURN
```

Program Listing 3. Print

```
1 CLEAR 3000
2 CLS:CLEAR:C3=0:PRINT"FILE LENGTH  50 (F) OR 100 (
3 A$=INKEY$:IFA$=""THEN3
4 IFA$="F"THENC3=1:GOTO10
5 IFA$=CHR$(13)THEN10
6 GOTO3
10 CLS:CLOSE
15 PRINT@23,"PARTS FILE MENU"
20 PRINT"-------------------------------------------------
--------
21 PRINT:PRINT
25 PRINT TAB(16)" 1. TO VIEW PART FILE
30 PRINT:PRINT TAB(16)" 2. TO LINE PRINT FILE
35 PRINT:PRINT TAB(16)" 3. TO EDIT OR ADD TO FILE
40 PRINT:PRINT TAB(16)" 4. TO CHANGE FILE LENGTH
70 IFC3=1THENC3$="50"ELSEC3$="100"
72 PRINT:PRINTTAB(11)"========== FILE LENGTH IS ";C3$;" ========
==="
75 PRINT:PRINT"SELECT NUMBER"
76 A$=INKEY$:IFA$=""THEN76
77 IFA$="1"THEN200
78 IFA$="2"THEN150
79 IFA$="3"THEN100
80 IFA$="4"THEN2
81 GOTO76
100 CLS:PRINT"EDIT FILE? (Y/ENT)"
101 A$=INKEY$:IFA$=""THEN101
102 IFA$="Y"THENRUN"EDIT"
103 IFA$=CHR$(13)THEN10
104 GOTO101
150 C2=0:CLS:PRINT"WHICH PRINTER? (XYMEC <X> OR ANADEX <A>)"
151 A$=INKEY$:IFA$=""THEN151
```

Program Listing 3 continues

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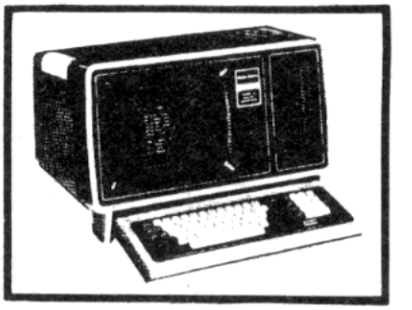

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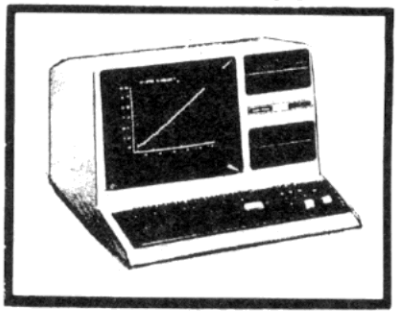

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Program Listing 3 continued

```
152 IFA$="A"THENC4=0:GOTO160
153 IFA$="X"THENC4=1:GOTO160
154 GOTO151
155 C2=0:GOTO1800
160 CLS:PRINT"IS PRINTER READY? (ENTER/N)"
161 A$=INKEY$:IFA$=""THEN161
162 IFA$=CHR$(13)THEN1800
163 IFA$="N"THEN10
164 GOTO161
200 REM - PRINT ROUTINE
205 C2=1:GOTO1800
210 FOR LR=ZTOZ1
212 GOSUB9300:GOSUB9100:GET1,PR
214 IFVAL(PP$)<1THEN220
215 GOSUB1400
216 GOSUB310:GOSUB380
220 PRINT"NEXT NUMBER? (ENT/N)"
221 A$=INKEY$:IFA$=""THEN221
222 IFA$="N"THEN225
223 IFA$=CHR$(13)THEN224ELSE221
224 NEXT:GOTO10
225 PRINT"REVIEW OR END? (R/ENT)"
226 A$=INKEY$:IFA$=""THEN226
227 IFA$="R"THEN216
228 IFA$=CHR$(13)THEN10
229 GOTO226
230 IFLR=Z1THEN10
232 Z=LR+1:GOTO210
250 OPEN"R",1,"PFILE1:1":OPEN"R",2,"PFILE2:1"
252 CLS:INPUT"ENTER PART NUMBER";X$
254 X1$=MID$(X$,3,2):LR=VAL(X1$)+1
255 IFC3=1THEN260
256 GOSUB9300:GOSUB9100:GET1,PR
257 RETURN
260 IFLR>50THENLR=LR-50
262 GOTO256
300 REM - PRINT ROUTINE
301 C=0
302 C2=1:GOSUB250
304 LS=LR:GOSUB1400:GOSUB310
306 GOSUB380:GOTO385
310 GOSUB9196
312 GOSUB9195
315 GOSUB1000:GOSUB1180
337 IFR1=0 AND R3=0THEN340
338 B$="":INPUT"FOR NOTE FILE ENTER 'N'";B$
339 IFB$="N"GOSUB750:CLS:GOTO315
340 Z$="":INPUT"FOR PRICE FILE ENTER 'PP'";Z$:IFZ$="PF"THEN360
345 GOSUB1000:GOSUB1180:GOSUB1050
350 Z$="":INPUT"FOR PRICE FILE ENTER 'PF'";Z$:IFZ$="PF"THEN360
355 RETURN
360 GOSUB1000:GOSUB1180:GOSUB2000
370 RETURN
380 X$="":INPUT"AUXILLARY FILES? (Y/ENT)";X$
381 IFX$="Y"THEN1100
382 X$="":INPUT"NOTE FILES? (Y/ENT)";X$:IFX$="Y"THEN390
383 RETURN
385 INPUT"ANOTHER NUMBER? (Y/N)";X$:IFX$="N"THEN10
386 IFX$="Y"THEN388
387 GOTO385
388 IFC=1THEN230
389 CLOSE:GOTO300
390 GOSUB750:GOSUB315:GOTO383
500 REM - LINEPRINT ROUTINE
505 CLS:C=0:GOSUB250:GOSUB1400:GOSUB510:GOTO522
506 PRINT"ANOTHER PART NUMBER? (ENT/N)"
507 A$=INKEY$:IFA$=""THEN507
508 IFA$=CHR$(13)THEN500
509 IFA$="N"THEN10ELSE507
510 LS=LR:GOSUB9196
512 GOSUB9195
513 IFC4=1THENGOSUB3000:GOTO516
515 GOSUB915:GOSUB1300
516 IFR1>0GOSUB550
517 IFR3>0GOSUB570
521 RETURN
522 IFR4>0THEN600
525 IFC=1THEN540
526 CLOSE:GOTO506
540 IFLR=Z1THEN10
542 Z=LR+1:IFC8=1THEN1880ELSE1855
550 OPEN"R",3,"NOTEFILE:1"
552 GOSUB560
553 IFR2>0LPRINT:GOSUB565
555 CLOSE3:RETURN
560 GOSUB9130:GET3,R1:GOSUB9070:IFC4=1THENGOSUB3100:RETURN
562 GOSUB970:RETURN
565 GOSUB9130:GET3,R2:GOSUB9070:IFC4=1THENGOSUB3110:RETURN
567 GOSUB972:RETURN
570 OPEN"R",4,"NFILE2:1"
572 GOSUB9150:GET4,R3:IFC4=1THENGOSUB3300:GOTO575
```

Program Listing 3 continues

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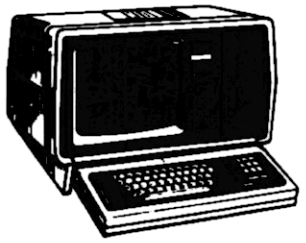

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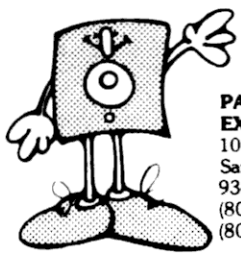

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Program Listing 3 continued

```
573 GOSUB990
575 CLOSE4:RETURN
600 IFC8=0THEN1205
605 PRINT@64,"PRESS ENTER TO CONTINUE (X TO END)"
606 A$=INKEY$:IFA$=""THEN606
607 IFA$=CHR$(13)THENPRINT@64,"                                ":GO
TO1205
608 IFA$="X"THEN10
609 GOTO606
750 REM-PRINT NOTE ROUTINE
752 IFR1=0THEN1600
755 OPEN"R",3,"NOTEFILE:1"
756 IFLOF(3)=0 GOTO790
762 GOSUB9130:GET3,R1
763 GOSUB9070
765 CLS:PRINT"--------- NOTE FILE A(1) #";R1;"FOR PART # ";PP$;"
 ---------"
766 GOSUB1035
767 GOSUB4100:CLOSE3
768 PRINT:X$="":INPUT"2ND NOTEFILE? (Y/ENT)";X$:IFX$="Y"THEN1600
769 INPUT"HIT 'ENTER' TO RETURN TO PART FILE";X
770 RETURN
790 PRINT"NO RECORDS IN FILE":FORZ=1TO200:NEXTZ:GOTO770
850 REM-PRINT 2ND NOTEFILE <B>
852 CLS:OPEN"R",4,"NFILE2:1"
854 PR=R3:GOSUB9150:GET4,PR
856 GOSUB4500
858 PRINT TAB(15) "* * * * * NOTES * * * * *"
860 GOSUB4525:CLOSE4
862 INPUT"HIT 'ENTER' TO RETURN TO PART FILE";X
864 GOTO770
900 REM - LINE PRINT ROUTINE
915 LPRINTSTRING$(80,"=")
916 LPRINT:LPRINTCHR$(14);PP$;:LPRINTCHR$(15);:LPRINTTAB(20);DP$
;TAB(40);MP$
920 LPRINT:LPRINT CHR$(14);TAB(7)"FACTORY NUMBER HISTORY";:LPRIN
TCHR$(15)
922 LPRINT TAB(13)"FACTORY NUMBER";TAB(33);"CATALOG YEAR & NOTES
"
923 LPRINTTAB(13)STRING$(40,"-")
924 LPRINT TAB(18);FA$;TAB(33);NA$
925 IFFB$<"!"ANDNB$<"!"THEN928
926 LPRINT TAB(18);FB$;TAB(33);NB$
928 IFFC$<"!"ANDNC$<"!"THEN930
929 LPRINT TAB(18);FC$;TAB(33);NC$
930 IFFD$<"!"ANDND$<"!"THEN932
931 LPRINT TAB(18);FD$;TAB(33);ND$
932 IFFE$<"!"ANDNE$<"!"THEN 935
934 LPRINT TAB(18);FE$;TAB(33);NE$
935 IFFF$<"!"ANDNF$<"!"THEN938
936 LPRINT TAB(18);FF$;TAB(33);NF$
938 IFFG$<"!"ANDNG$<"!"THEN940
939 LPRINT TAB(18);FG$;TAB(33);NG$
940 LPRINTTAB(13)STRING$(40,"-"):RETURN
970 LPRINT:LPRINTCHR$(14);TAB(14)"HISTORY";:LPRINTCHR$(15)
972 LPRINT TAB(20)"PART #";TAB(30)"FACT. #";TAB(40)"YEAR"
975 LPRINT TAB(20);E1$;TAB(30);H1$;TAB(40);J1
976 LPRINT TAB(20);E2$;TAB(30);H2$;TAB(40);J2
977 IFE3$<"!"THEN979
978 LPRINT TAB(20);E3$;TAB(30);H3$;TAB(40);J3
979 IFE4$<"!"THEN981
980 LPRINT TAB(20);E4$;TAB(30);H4$;TAB(40);J4
981 IFE5$<"!"THEN 983
982 LPRINT TAB(20);E5$;TAB(30);H5$;TAB(40);J5
983 IFM2$<"!"THEN985
984 LPRINT TAB(10);M2$
985 IFM3$<"!"THEN987
986 LPRINT TAB(10);M3$
987 IFM4$<"!"THEN 989
988 LPRINT TAB(10);M4$
989 RETURN
990 LPRINT:LPRINTCHR$(14)TAB(15)"NOTES":LPRINTCHR$(15)
992 LPRINT TAB(10);M5$:LPRINT TAB(10);M6$:LPRINT TAB(10);M7$
993 LPRINT TAB(10);M8$:LPRINT TAB(10);M9$
994 RETURN
1000 CLS
1005 PRINT"---------------------- PARTS FILE --------------------
-"
1035 PRINT"PART # ";PP$;TAB(20)"FACT. # ";GP$;TAB(40);DP$
1036 PRINT"NOTES: ";MP$
1037 GOSUB9170
1040 RETURN
1050 PRINT:PRINT"FACT. #","YEAR & NOTES"
1055 PRINT"<1>";FA$,NA$
1056 PRINT"<2>";FB$,NB$
1057 PRINT"<3>";FC$,NC$
1058 PRINT"<4>";FD$,ND$
1059 PRINT"<5>";FE$,NE$
1060 PRINT"<6>";FF$,NF$
1061 PRINT"<7>";FG$,NG$
```

Program Listing 3 continues

Program Listing 3 continued

```
1065 RETURN
1100 CLS: P1$=LEFT$(PP$,4)
1102 P3$="":INPUT"PART # (IF ALL OF SAME # HIT 'ENTER')";P3$:IFP
3$=""THEN1205
1103 IFR4=0THEN1118
1105 A=R4:GOSUB1109:A=R5:GOSUB1109:A=R6:GOSUB1109:A=R7:GOSUB1109
:A=R8:GOSUB1109:A=R9:GOSUB1109:A=S1:GOSUB1109:A=S2:GOSUB1109
1106 A=S3:GOSUB1109:A=S4:GOSUB1109:A=S5:GOSUB1109:A=S6:GOSUB1109
:A=S7:GOSUB1109:A=S8:GOSUB1109:A=S9:GOSUB1109:GOTO1118
1109 IFA=0PRINT"END OF ";P1$;" FILES":GOTO1119
1110 IFC3=1THENLR=A+50ELSELR=A+100
1111 GOSUB9165:GOSUB9300:GOSUB9100:GET1,PR
1112 X=LEN(P3$):X$=LEFT$(PP$,X)
1114 IF P3$=X$THEN1140
1116 RETURN
1118 PRINT"PART NUMBER NOT IN AUXILLARY FILE"
1119 PRINT:GOTO1142
1124 GOSUB9200
1126 GOSUB9300:GOSUB9100:GET1,PR
1130 A$="":INPUT"INPUT ANOTHER PART NUMBER? (Y/ENT)";A$:IFA$="Y"
THEN1124
1132 X$=P1$:GOSUB254
1134 GOSUB310
1137 GOTO380
1140 GOSUB312
1142 A$="":INPUT"ANOTHER AUXILLARY FILE #? (Y/N)";A$:IFA$="Y"THE
NCLS:GOTO1102
1143 IFA$="N"THEN1132
1144 GOTO1142
1180 IFC3=1THEN1190
1181 IFLR>100RETURN
1183 IFR4>0THENPRINT@192,"AUX. ";R4;",";R5;",";R6;",";R7;",";R8
1184 IFR9>0THENPRINT@264,R9;",";S1;",";S2;",";S3;",";S4;",";S5;"
,";S6;",";S7;",";S8;",";S9
1185 RETURN
1190 IFLR>50RETURN
1192 GOTO1183
1200 REM - FIND AUXILLARY PART FILES (PRINT)
1205 A=R4:GOSUB1207:A=R5:GOSUB1207:A=R6:GOSUB1207:A=R7:GOSUB1207
:A=R8:GOSUB1207:A=R9:GOSUB1207:A=S1:GOSUB1207:A=S2:GOSUB1207:A=S
3:GOSUB1207:A=S4:GOSUB1207:A=S5:GOSUB1207:A=S6:GOSUB1207:A=S7:GO
SUB1207:A=S8:GOSUB1207:A=S9:GOSUB1207:GOTO1270
1207 IFA=0THEN1270
1208 IFC3=1THENLR=A+50ELSELR=A+100
1209 GOSUB9165:GOSUB9300:GOSUB9100:GET1,PR
1210 GOTO1250
1215 CLS:PRINT"NO MORE ";P$;"'S IN FILE"
1216 INPUT"HIT 'ENTER' TO RETURN TO MAIN PART FILE";Z
1217 GOTO1225
1220 GOSUB312
1222 A$="":INPUT"ANOTHER AUX. #? (Y/N)";A$:IFA$="Y"THEN RETURN
1223 IFA$="N"THEN1225
1224 GOTO1222
1225 X$=PP$:GOSUB254
1226 GOSUB312
1228 GOSUB382:GOTO385
1230 RETURN
1250 GOSUB1400
1251 IFC2=1THEN1220
1252 GOSUB512
1255 IFC8=0THENRETURN
1256 PRINT@64,"PRESS ENTER TO CONTINUE (X TO END)"
1257 A$=INKEY$:IFA$=""THEN1257
1258 IFA$=CHR$(13)THENPRINT@64,"                                ":RE
TURN
1259 IFA$="X"THEN10
1260 GOTO1257
1270 LR=LS:IFC2=1THEN1215
1271 GOTO525
1300 LPRINTCHR$(14)TAB(14)"PRICES";:LPRINTCHR$(15)
1302 Q1$="###.##":GOSUB9050
1305 LPRINT"  1909";TAB(10)"  1912";TAB(20)"  1915";TAB(30)"  19
18";TAB(40)"  1921";TAB(50)"  1924";TAB(60)"  1927"
1306 IFO>0LPRINTUSINGQ1$;O;
1307 IFT2>0LPRINTTAB(10)USINGQ1$;T2;
1308 IFT5>0LPRINTTAB(20)USINGQ1$;T5;
1309 IFT8>0LPRINTTAB(30)USINGQ1$;T8;
1310 IFW1>0LPRINTTAB(40)USINGQ1$;W1;
1311 IFW4>0LPRINTTAB(50)USINGQ1$;W4;
1312 IFW7>0LPRINTTAB(60)USINGQ1$;W7:GOTO1315
1314 LPRINT
1315 LPRINT:LPRINT"  1910";TAB(10)"  1913";TAB(20)"  1916";TAB(3
0)"  1919";TAB(40)"  1922";TAB(50)"  1925"
1316 IFT>0LPRINTUSINGQ1$;T;
1317 IFT3>0LPRINTTAB(10)USINGQ1$;T3;
1318 IFT6>0LPRINTTAB(20)USINGQ1$;T6;
1319 IFT9>0LPRINTTAB(30)USINGQ1$;T9;
1320 IFW2>0LPRINTTAB(40)USINGQ1$;W2;
1321 IFW5>0LPRINTTAB(50)USINGQ1$;W5:GOTO1325
1323 LPRINT
```

Program Listing 3 continues

BUGOUT

MOD I **MOD III**

THE ULTIMATE BUG CATCHER!

THREE POWERFUL MACHINE LANGUAGE MONITORS

UNEQUALLED ASSEMBLY LANGUAGE INSTRUCTION

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Order No. BUGV3D DISK **$69.95**

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Program Listing 3 continued

```
1325 LPRINT:LPRINT"  1911";TAB(10)"  1914";TAB(20)"  1917";TAB(3
0)"  1920";TAB(40)"  1923";TAB(50)"  1926"
1326 IFT1>0LPRINTUSINGQ1$;T1;
1327 IFT4>0LPRINTTAB(10)USINGQ1$;T4;
1328 IFT7>0LPRINTTAB(20)USINGQ1$;T7;
1329 IFW>0LPRINTTAB(30)USINGQ1$;W;
1330 IFW3>0LPRINTTAB(40)USINGQ1$;W3;
1331 IFW6>0LPRINTTAB(50)USINGQ1$;W6:GOTO1335
1333 LPRINT
1335 LPRINT:RETURN
1400 PR=LR:GOSUB9110:GET2,PR:RETURN
1500 REM - SELECT NOTEFILE A(2)
1502 GOSUB9140:OPEN"R",3,"NOTEFILE:1"
1505 IFR2=0THEN1550
1508 PR=R2+1:GOSUB810
1510 GOTO515
1550 PR=LOF(3)
1552 R2=PR
1555 GOSUB710
1560 GOTO515
1600 REM - PRINT 2ND NOTEFILES A AND B
1602 CLS
1605 IF R2=0GOTO 1630
1606 OPEN"R",3,"NOTEFILE:1"
1608 GOSUB9140
1612 GOSUB9130:GET3,R2
1614 GOSUB9070
1615 PRINT"--------- NOTE FILE A(2) #";R2; "FOR P/N ";PP$; "----
---------"
1617 GOSUB1035:GOSUB9170
1618 GOSUB4100:CLOSE3
1620 PRINT:INPUT"NOTEFILE B? (Y/ENT)";X$:IFX$="Y"THEN1630
1622 RETURN
1630 IF R3=0PRINT"NO SECOND FILES RECORDED":GOTO 1680
1632 OPEN"R",4,"NFILE2:1"
1636 GOSUB9150:GET4,R3
1638 GOSUB4500:GOSUB4522
1640 CLOSE4
1645 PRINT:INPUT"HIT 'ENTER' TO RETURN TO PART FILE";X
1650 RETURN
1680 FOR X=1 TO 200: NEXTX:RETURN
1800 REM SEQUENTIAL PRINT ROUTINE
1810 C=0:CLS:PRINT"SEQUENTIAL OR INDIVIDUAL PRINT? (S/I)"
1811 A$=INKEY$:IFA$=""THEN1811
1812 IFA$="S"THENC=1:GOTO1840
1814 IFA$="I"THEN1890
1816 GOTO1811
1840 INPUT"BEGINNING PART NUMBER";Z$:Z1$=MID$(Z$,3,2):Z=VAL(Z1$)
+1
1842 INPUT"ENDING PART NUMBER";ZA$:ZB$=MID$(ZA$,3,2):Z1=VAL(ZB$)
+1
1843 PRINT"PAUSE BETWEEN NUMBERS? (Y/ENT) ";:
1844 A$=INKEY$:IFA$=""THEN1844
1845 IFA$="Y"THENC8=1:PRINTA$:GOTO1848
1846 IFA$=CHR$(13)THENC8=0:GOTO1848
1847 GOTO1844
1848 IFC3=1THEN1875
1850 OPEN"R",1,"PFILE1:1":OPEN"R",2,"PFILE2:1":GOSUB9200
1852 IFC2=1THEN210
1855 FOR LR=ZTOZ1
1860 GOSUB9300:GOSUB9100:GET1,PR
1862 IFVAL(PP$)<1THEN1870
1865 GOSUB1400:GOSUB510:GOTO522
1866 IFC8=1THEN1880
1870 NEXTLR
1872 CLOSE:GOTO10
1875 IFZ>50THENZ=Z-50:Z1=Z1-50
1876 GOTO1850
1880 PRINT"PRESS ENTER TO CONTINUE, X TO END"
1881 A$=INKEY$:IFA$=""THEN1881
1882 IFA$=CHR$(13)THENPRINT@256,"
     ":GOTO1855
1883 IFA$="X"THEN10
1884 GOTO1881
1890 IFC2=1THEN300
1892 C8=0:PRINT"PAUSE BETWEEN NUMBERS? (Y/ENT)"
1893 A$=INKEY$:IFA$=""THEN1893
1894 IFA$=CHR$(13)THEN500
1895 IFA$="Y"THENC8=1:GOTO500
1896 GOTO1893
2000 REM - PRINT PRICE ROUTINE
2010 GOSUB2100
2030 PRINT"(1909)";TAB(12)"(1913)";TAB(24)"(1917)";TAB(36)"(1921
)";TAB(48)"(1925)"
2031 PRINTUSINGQ$;O;T3;T7;W1;W5
2032 PRINT"(1910)";TAB(12)"(1914)";TAB(24)"(1918)";TAB(36)"(1922
)";TAB(48)"(1926)"
2033 PRINTUSINGQ$;T;T4;T8;W2;W6
2034 PRINT"(1911)";TAB(12)"(1915)";TAB(24)"(1919)";TAB(36)"(1923
)";TAB(48)"(1927)"
```

Program Listing 3 continues

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CP/M 2.2 is the latest version of CP/M from Digital Research. Our package also includes the MAPPER I CP/M adapter and a sophisticated set of utilities and drivers designed to optimize the CP/M system for the TRS-80.
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CBASIC II is the most widely used BASIC for CP/M applications programs. This version of BASIC contains all of the features necessary to develop complex business programs.
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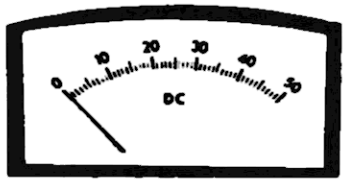
★ SUPERMETER ★



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Program Listing 3 continued

```
2035 PRINTUSINGQQ$;T1;T5;T9;W3;W7
2036 PRINT"(1912)";TAB(12)"(1916)";TAB(24)"(1928)";TAB(36)"(1924
)"
2037 PRINTUSINGQQ$;T2;T6;W;W4
2040 RETURN
2100 Q$="###.##      ###.##      ###.##      ###.##      ###.##
2105 PRINT"---------------------- PRICES ----------------------"
2110 GOSUB9050
2115 RETURN
3000 'LP1=5-15-30-45-48-58-62-80   LP2=8-17-25-40-55-80   LP3=5-
15-25-35-45-55-65-75
3001 E$=CHR$(27)
3002 DEFFNNP$=E$+"A0":DEFFNNU$=E$+"A1":DEFFNBP$=E$+"A2":DEFFNBU$
=E$+"A3":DEFFNPS$=E$+"B3":DEFFNSP$=E$+"B2"
3005 DEFFNTB$=CHR$(9):DEFFNLF$=E$+"0":DEFFNCT$=E$+"P"
3040 LPRINTFNLF$;"1";
3045 LPRINTFNSP$;STRING$(75,"=")
3050 LPRINTFNPS$:LPRINTFNBP$;PP$;FNNP$;FNTB$;DP$;FNTB$;MP$;FNTB$
;FNBP$;"FACTORY NO.";FNTB$;FNTB$;"YEAR/NOTES";FNNP$
3055 GOSUB3090:LPRINTFA$;FNTB$;NA$
3058 IFFB$<"1"ANDNB$<"1"THEN3062
3060 GOSUB3090:LPRINTFB$;FNTB$;NB$
3062 IFFC$<"1"ANDNC$<"1"THEN3066
3064 GOSUB3090:LPRINTFC$;FNTB$;NC$
3066 IFFD$<"1"ANDND$<"1"THEN3070
3068 GOSUB3090:LPRINTFD$;FNTB$;ND$
3070 IFFE$<"1"ANDNE$<"1"THEN3074
3072 GOSUB3090:LPRINTFE$;FNTB$;NE$
3074 IFFF$<"1"ANDNF$<"1"THEN3078
3076 GOSUB3090:LPRINTFF$;FNTB$;NF$
3078 IFFG$<"1"ANDNG$<"1"THEN3082
3080 GOSUB3090:LPRINTFG$;FNTB$;NG$
3082 GOTO3208
3090 FORX=1TO4:LPRINTFNTB$;:NEXTX:RETURN
3092 FORX=1TO4:LPRINTFNTB$;:NEXTX:RETURN
3100 LPRINTFNLF$;"2";FNBU$;FNCT$;"H I S T O R Y"
3102 LPRINTFNTB$;FNTB$;FNBP$;"PART #";FNTB$;"FACT. #";FNTB$;"YEA
R"
3104 LPRINTFNTB$;FNTB$;FNNP$;E1$;FNTB$;H1$;FNTB$;J1
3106 LPRINTFNTB$;FNTB$;E2$;FNTB$;H2$;FNTB$;J2
3108 IFE3$<"1"THEN3112
3110 LPRINTFNTB$;FNTB$;E3$;FNTB$;H3$;FNTB$;J3
3112 IFE4$<"1"THEN3116
3114 LPRINTFNTB$;FNTB$;E4$;FNTB$;H4$;FNTB$;J4
3116 IFE5$<"1"THEN3120
3118 LPRINTFNTB$;FNTB$;E5;FNTB$;H5$;FNTB$;J5
3120 LPRINTFNTB$;M2$:IFM3$<"1"THEN3124
3122 LPRINTFNTB$;M3$
3124 IFM4$<"1"THEN3130
3126 LPRINTFNTB$;M4$
3130 RETURN
3200 LPRINTFNLF$;"3";FNBU$;FNCT$;"P R I C E S"
3201 Q1$="###.##":GOSUB 9050
3202 LPRINTFNBP$;"  1909";FNTB$;"  1912";FNTB$;"  1915";FNTB$;"
 1918";FNTB$;"  1921";FNTB$;"  1924";FNTB$;"  1927";FNNP$
3204 IFO>0LPRINTUSINGQ1$;O;
3205 LPRINTFNTB$;:IFT2>0LPRINTUSINGQ1$;T2;
3206 LPRINTFNTB$;:IFT5>0LPRINTUSINGQ1$;T5;
3207 LPRINTFNTB$;:IFT8>0LPRINTUSINGQ1$;T8;
3208 LPRINTFNTB$;:IFW1>0LPRINTUSINGQ1$;W1;
3209 LPRINTFNTB$;:IFW4>0LPRINTUSINGQ1$;W4;
3210 LPRINTFNTB$;:IFW7>0LPRINTUSINGQ1$;W7;
3214 LPRINT:LPRINTFNBP$;"  1910";FNTB$;"  1913";FNTB$;"  1916";F
NTB$;"  1919";FNTB$;"  1922";FNTB$;"  1925";FNNP$
3215 IFT>0LPRINTUSINGQ1$;T;
3216 LPRINTFNTB$;:IFT3>0LPRINTUSINGQ1$;T3;
3217 LPRINTFNTB$;:IFT6>0LPRINTUSINGQ1$;T6;
3218 LPRINTFNTB$;:IFT9>0LPRINTUSINGQ1$;T9;
3219 LPRINTFNTB$;:IFW2>0LPRINTUSINGQ1$;W2;
3220 LPRINTFNTB$;:IFW5>0LPRINTUSINGQ1$;W5;
3225 LPRINT:LPRINTFNBP$;"  1911";FNTB$;"  1914";FNTB$;"  1917";F
NTB$;"  1920";FNTB$;"  1923";FNTB$;"  1926";FNNP$
3226 IFT1>0LPRINTUSINGQQ1$;T1;
3227 LPRINTFNTB$;:IFT4>0LPRINTUSINGQ1$;T4;
3228 LPRINTFNTB$;:IFT7>0LPRINTUSINGQ1$;T7;
3229 LPRINTFNTB$;:IFW>0LPRINTUSINGQ1$;W;
3230 LPRINTFNTB$;:IFW3>0LPRINTUSINGQ1$;W3;
3231 LPRINTFNTB$;:IFW6>0LPRINTUSINGQ1$;W6;
3233 LPRINT:RETURN
3300 LPRINTFNLF$;"2";FNCT$;FNBU$;"N O T E S";FNNP$
3305 LPRINTFNTB$;M5$:IFM6$<"1"THEN3307
3306 LPRINTFNTB$;M6$
3307 IFM7$<"1"THEN3308ELSELPRINTFNTB$;M7$
3308 IFM8$<"1"THEN3309ELSELPRINTFNTB$;M8$
3309 IFM9$<"1"THEN3310ELSELPRINTFNTB$;M9$
3310 RETURN
4000 CLS:PRINT"---------NOTE FILE (";R1;") FOR PART # ";PP$;" --
--------"
4005 GOSUB1035
4010 PRINT:PRINT"PART #","FACT #","YEAR INTRODUCED"
```

Program Listing 3 continues

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Now you can place your TRS-80 Model 1 components into one convenient desk top package. The ORGANIZER puts everything within reach, with room for Monitor, Expansion Interface, four Disk Drives, Diskettes, Cassettes and tape recorder. The ORGANIZER eliminates messy wires, reduces eye and body strain, provides room for ventilation, and works as a dust shield.

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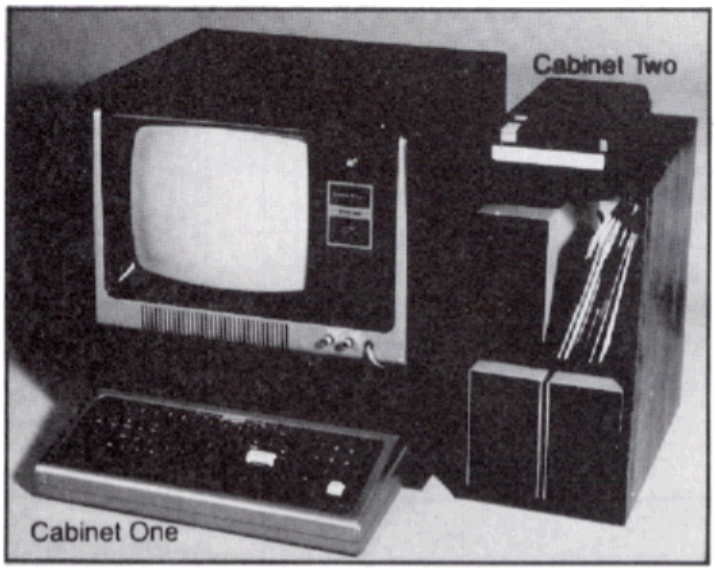

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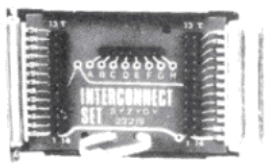

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Program Listing 3 continued

```
4015 PRINT"<1> (1)";EA$;TAB(20)"(6)";HA$;TAB(40)"(11)";J1
4017 PRINT"<2> (2)";EB$;TAB(20)"(7)";HB$;TAB(40)"(12)";J2
4020 PRINT"<3> (3)";EC$;TAB(20)"(8)";HC$;TAB(40)"(13)";J3
4022 PRINT"<4> (4)";ED$;TAB(20)"(9)";HD$;TAB(40)"(14)";J4
4024 PRINT"<5> (5)";EE$;TAB(20)"(10)";HE$;TAB(40)"(15)";J5
4026 PRINT:PRINT"(16)NOTES: ";MB$
4028 PRINT"(17)NOTES: ";MC$
4030 PRINT"(18)NOTES: ";MD$
4040 RETURN
4100 PRINT:PRINT"PART #","FACT. #","YEAR INTRODUCED"
4105 PRINT"<1> ";E1$,H1$,J1
4106 PRINT"<2> ";E2$,H2$,J2
4107 PRINT"<3> ";E3$,H3$,J3
4108 PRINT"<4> ";E4$,H4$,J4
4109 PRINT"<5> ";E5$,H5$,J5
4110 PRINT"<6> NOTES: ";M2$
4111 PRINT"<7> NOTES: ";M3$
4112 PRINT"<8> NOTES: ";M4$
4120 RETURN
4500 CLS:PRINT@10,"NOTE FILE (B) # ";R3;" FOR PART # ";PP$
4505 GOSUB1035
4510 GOSUB9170
4515 PRINT
4520 RETURN
4522 PRINT"------------------- NOTES -------------------"
4523 PRINT
4525 PRINT"(1)";M5$
4526 PRINT"(2)";M6$
4527 PRINT"(3)";M7$
4528 PRINT"(4)";M8$
4529 PRINT"(5)";M9$
4530 RETURN
9050 O=CVS(O$):T=CVS(T$):T1=CVS(T1$):T2=CVS(T2$):T3=CVS(T3$):T4=
CVS(T4$):T5=CVS(T5$):T6=CVS(T6$):T7=CVS(T7$):T8=CVS(T8$):T9=CVS(
T9$)
9052 W=CVS(W$):W1=CVS(W1$):W2=CVS(W2$):W3=CVS(W3$):W4=CVS(W4$):W
5=CVS(W5$):W6=CVS(W6$):W7=CVS(W7$)
9055 RETURN
9070 J1=CVI(J1$):J2=CVI(J2$):J3=CVI(J3$):J4=CVI(J4$):J5=CVI(J5$)
9080 IFJ1<1THENJ1=0:IFJ2<1THENJ2=0:IFJ3<0THENJ3=0:IFJ4<1THENJ4=0
:IFJ5<1THENJ5=0
9081 RETURN
9100 FIELD1,SR*126ASD2$,8ASPP$,8ASGP$,2ASR1$,2ASR2$,2ASR3$,14ASD
P$,14ASMP$,4ASO$,4AST$,4AST1$,4AST2$,4AST3$,4AST4$,4AST5$,4AST6$
,4AST7$,4AST8$,4AST9$,4ASW$,4ASW1$,4ASW2$,4ASW3$,4ASW4$,4ASW5$,4
ASW6$,4ASW7$
9105 RETURN
9110 FIELD2,8ASFA$,22ASNA$,8ASFB$,22ASNB$,8ASFC$,22ASNC$,8ASFD$,
22ASND$,8ASFE$,22ASNE$,8ASFF$,22ASNF$,8ASFG$,22ASNG$,2ASR4$,2ASR
5$,2ASR6$,2ASR7$,2ASR8$,2ASR9$,2ASS1$,2ASS2$,2ASS3$,2ASS4$,2ASS5
$,2ASS6$,2ASS7$,2ASS8$,2ASS9$
9120 RETURN
9130 FIELD3,8ASE1$,8ASE2$,8ASE3$,8ASE4$,8ASE5$,8ASH1$,8ASH2$,8AS
H3$,8ASH4$,8ASH5$,2ASJ1$,2ASJ2$,2ASJ3$,2ASJ4$,2ASJ5$,52ASM2$,52A
SM3$,50ASM4$
9135 RETURN
9140 EA$="":EB$="":EC$="":ED$="":EE$="":HA$="":HB$="":HC$="":HD$
="":HE$="":J1=0:J2=0:J3=0:J4=0:J5=0
9141 MB$="":MC$="":MD$=""
9142 E1$="":E2$="":E3$="":E4$="":E5$="":H1$="":H2$="":H3$="":H4$
="":H5$="":J1$="":J2$="":J3$="":J4$="":J5$=""
9143 M2$="":M3$="":M4$=""
9144 RETURN
9150 FIELD 4,50AS M5$,50AS M6$,50AS M7$,50AS M8$,50AS M9$
9155 RETURN
9165 R1=0:R2=0:R3=0:RETURN
9170 REM - PRINT NOTES
9172 IF R1>0PRINT@162,"NOTEFILE (A) ";R1;",";R2
9173 IF R3>0PRINT@226,"NOTEFILE (B) ";R3
9174 IF R1=0 AND R3=0 PRINT@168,"NO NOTE FILES"
9175 RETURN
9195 R1=CVI(R1$):R2=CVI(R2$):R3=CVI(R3$):RETURN
9196 R4=CVI(R4$):R5=CVI(R5$):R6=CVI(R6$):R7=CVI(R7$):R8=CVI(R8$)
:R9=CVI(R9$):S1=CVI(S1$):S2=CVI(S2$):S3=CVI(S3$):S4=CVI(S4$):S5=
CVI(S5$):S6=CVI(S6$):S7=CVI(S7$):S8=CVI(S8$):S9=CVI(S9$)
9197 RETURN
9200 REM - FIND RECORDS
9205 SR=1:PR=LOF(1)
9210 GOSUB9100
9212 GET1,PR
9215 IFPP$<"1" THENLR=PR*2-1 ELSE LR=PR*2
9218 RETURN
9220 PR=LOF(2):GOSUB9110
9225 GET 2, PR
9230 RETURN
9250 PR=LOF(3)
9252 GOSUB9130:GET3,PR
9260 RETURN
9300 PR=INT((LR-1)/2)+1:SR=LR-2*INT((LR-1)/2)-1
9302 RETURN
```

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3. The following SCIENTIFIC MATH functions are not supported: ATN, EXP, COS, SIN, LOG, SIN, or TAN. (Subroutines to do these functions are included in the ZBASIC 2.0 manual.)
4. Some ZBASIC 2.0 commands do not work exactly as BASICs commands work. For instance, END jumps to DOS, STOP jumps to BASIC READY. Other commands may also differ slightly.
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6. Since programs compiled by ZBASIC 2.0 are no longer in BASIC, DIRECT COMMANDS like EDIT, CONT, LIST, LLIST, MEM AUTO etc. are not supported. Although they may be used while in BASIC before compiling.
7. All other commands not supported by ZBASIC 2.0 not described above: CMD, DEF, FN, ERR, ERROR, ERL, RESUME, USING, FIX, FRE, INSTR, TAB, TIME$, CDBL, CINT, CSNG.

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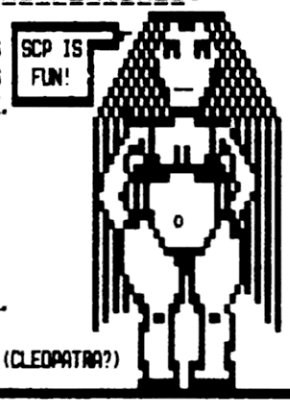

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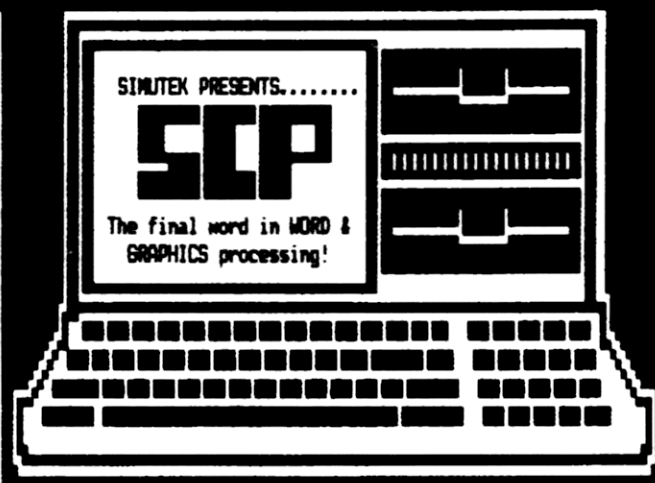

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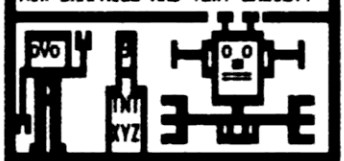

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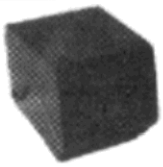

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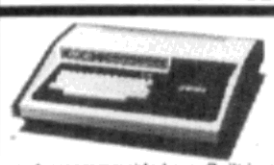

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Save money by installing your Model III disk drives yourself.

Do-It-Yourself Disks

James S. Shaefer
33 Jackson Road
Berlin, NJ 08009

After adding memory to the Model III, the next step for most would be to install a disk system.

I chose the Disk III expansion package from VR Data. One reason was location (they are only a half-hour away), and the other was prices. For the same price Radio Shack charges to install one drive you can install two. Also, they have earned a good reputation in the Philadelphia area computer clubs for service.

When the package arrived it contained two drives, a controller board, power supply board and mounting hardware.

Installing the drives took about two hours. I used a large table so both the front and back of the computer would be accessible without moving the computer. If you choose this approach you do not need to disconnect the wiring going to the screen.

First, put something soft on the table to prevent scratching the computer case. Remove the single screw on the back side of the computer. Next, turn the computer over and remove the ten screws from the bottom, making sure you remember where the different screws came from. Turn the computer right side up again, holding both the top and bottom together as you do. Lift the top half up and then to the left. Be very careful as the back of the picture tube is only about half an inch away from the bracket connected to the bottom half of the computer.

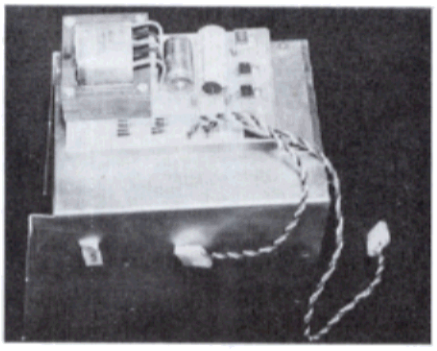

Photo 2.

As you move around to the back of the computer, you will see the main circuit board. This must be removed to install the disk controller board. In new Model III's, there is an aluminum shield covering the circuit board which reduces the EMI radiation levels which causes interference. If your computer has the shield, remove it. Carefully look at the main circuit board and note where the connectors are plugged in. Mark them so you will be able to reconnect them in their original order.

Remove the cables and take out the main

The Key Box

Model III disk drive installation.

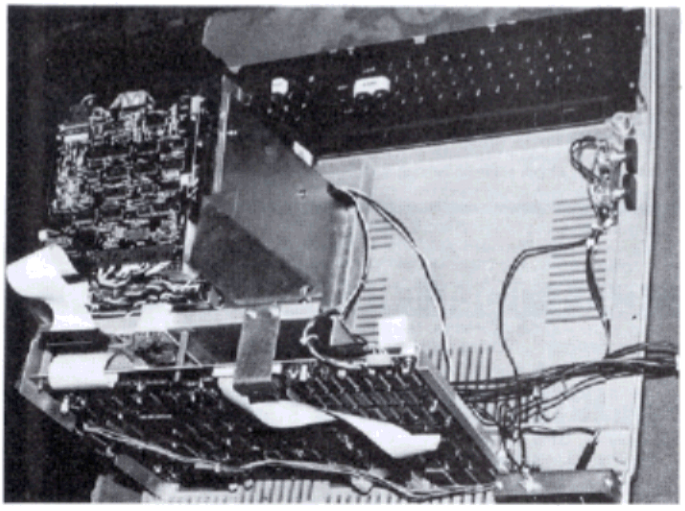

Photo 1.

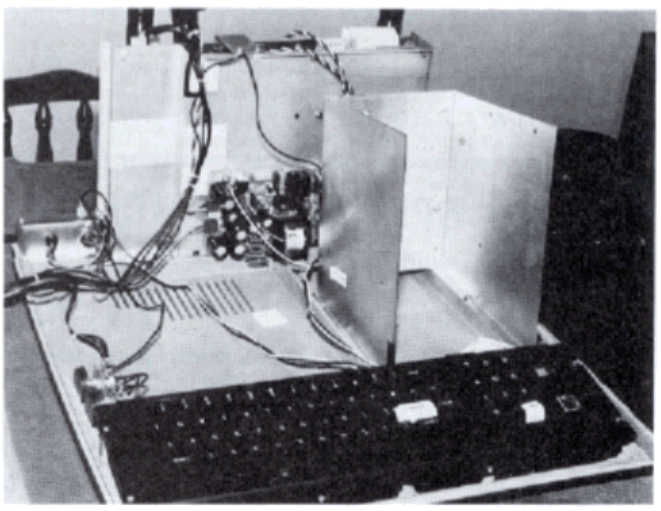

Photo 3.

"For the same price Radio Shack charges to install one board, you can install two."

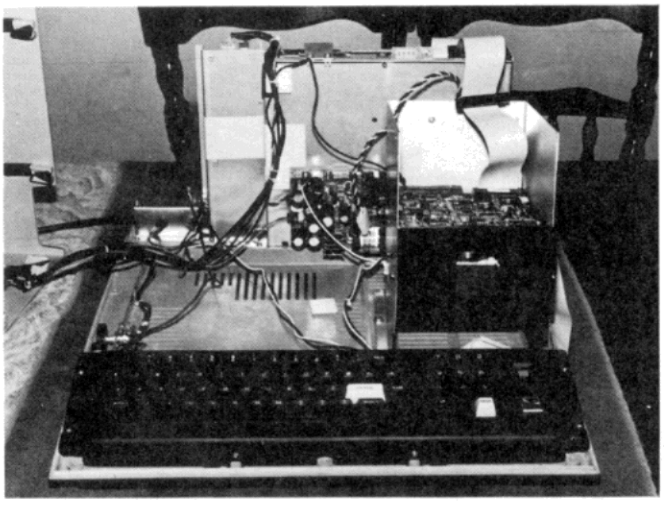

Photo 4.

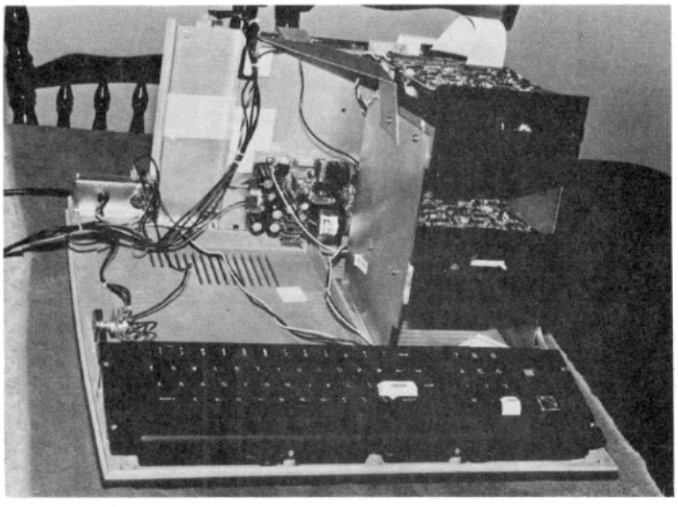

Photo 5.

circuit board. The disk controller board will fit behind the main circuit board you just removed. Next, mount the disk controller board to the back left side of the computer chassis. In the older Model III's you will need to come up with some kind of spacer to put between the chassis and controller board. I used some rubber washers. The newer Model III's have four metal spacers you can use to mount the controller board.

When the disk controller board is installed you then remount the main circuit board and reconnect the cables to it (Photo 1) shows the disk controller board mounted behind the main circuit board.

Next, mount the power board to the back of the drive chassis (see Photo 2). Now locate the spare AC connector, strapped to the bottom of the computer. You unstrap it and plug it into the bottom of the power supply board. Photo 3 shows the drive chassis mounted to the bottom half of the computer. The white square to the left of the drive chassis is where the AC connector was strapped.

Carefully plug the 20-pin jumper cable between the top of the main circuit board and the top of the disk controller board. This may take some time so be patient. An eight-connector jumper cable is now plugged from the top of the main circuit board and twisted once before the other end is plugged in above the Z80 (see Photo 1). If your computer had an aluminum shield, cut it so the cables will clear and remount it over the main circuit board.

The disk drives are now mounted in the drive chassis (Photos 4 and 5). After connecting the power cables and the 34-pin flat signal cables to them, you're almost finished. Cut out the plastic disk drive blanks on the top half of the computer and carefully place the top cover back on the computer. Hold the two halves together and turn the computer over. Replace the ten screws in the bottom and the one on the back of the computer. Turn the computer right side up and enjoy the use of your new disk drives. ■

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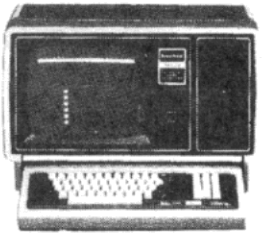

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The Key Box

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1K RAM

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Guerri F. Stevens
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The Exercise Log Program written for the TRS-80 Pocket Computer keeps track of exercise based on miles, time, or both. Use it to record jogging, walking, cycling, swimming or any other activity you perform for some distance or time.

Features

The program provides for entry of daily time or distance. At the end of each week the pocket computer produces a weekly total, daily average, year-to-date total, 1-12 week total, and breakdown time or distance.

The breakdown time or distance is the maximum you can perform based on your training. It is calculated as a factor multiplied by either the average daily exercise or the total accumulated over a period of time. The breakdown point for running is three times the average daily distance, or one-twentieth of the total for the past two months. You can specify the breakdown factor; the program determines the multiplier (daily time/distance or accumulated time/distance) based on the factor.

When the summary is produced, the current weekly total is added to the totals being saved and the least recent total is dropped.

Using the Program

Put the program into your computer using Program Listing 1. Leave out the colon following the line number and all spaces not in quotation marks. When you have entered the program use the MEM command to display the memory size. The response should be 153 steps 19 memories. If you alter the program you must leave at least 17 memories available.

To execute a menu section put the computer in the DEF mode, and press the shift key and the appropriate letter:

- S Initialization
- D Daily entry of distance or time
- F Finish a week and produce summary
- B Begin a new year

Initialization

Before using the program you must tell it what you want to record (time, distance, or both), how many weekly totals to save, and how to calculate your breakdown point (time or distance).

Turn the computer on, put it into the DEF mode, and run the initialization routine. The program prompts you and checks each response for validity. To recover from error messages press Enter. The program will return to its request; enter the correct value.

The program keeps weekly totals of time, distance or both for the number of weeks you specify. Each week the oldest information is dropped and current information is added. The sum of these weekly totals is used in calculating your breakdown point.

Enter the factor you want to use in calculating your breakdown point. This may be an integer (such as three) or a fraction (such as 1/20). If the factor is less than one the program calculates the breakdown point as the product of the factor and the sum of the weekly totals. If the factor is greater than or equal to one the program calculates the breakdown point as the product of the factor and the daily average for the current week.

Daily Entry

Enter the distance, time or both once each day. (If you have two exercise sessions per day sum them and enter only the total.) Each time you enter information a counter is incremented. The counter is used to calculate the daily average at the end of the week. Press the shifted D in the DEF mode to make a daily entry. The distance you cover need not be an integer.

Enter time as MM.SS, where MM is the minutes and SS is the seconds. Convert hours to minutes. If the seconds portion is less than ten enter a leading zero.

Weekly Total

Have your training diary handy to write down totals as they appear. Press Enter to

"Use it to record jogging, walking, cycling, swimming or any other activity you perform for some distance or time."

review each display. Press Enter after the last display so the program can finish processing.

Begin a New Year

This portion of the program resets the year-to-date totals. Since the new year may begin in the middle of a week the program adds the total for the week so far to the year-to-date total. The year-to-date total is displayed and the next year-to-date total is set to *minus* the total for the week so far. When you finish the week, adding the weekly total yields a total of only the days actually in the new year.

Suggestions

If you start using this program in the middle of the year the year-to-date total and the weekly totals for the specified number of weeks (N) will be zero. You may record information from the beginning of the year to set up these values. Alternatively forget about them and ignore the year-to-date totals until next year. After N weeks the weekly totals will be correct. Until then ignore them and

```
 10:"S"CLEAR
 20:INPUT "<T>IME, <D>IST, <B>OTH? ";A$
 30:IF A$="T"GOTO 70
 40:IF A$="D"GOTO 70
 50:IF A$="B"GOTO 70
 60:GOSUB 110:GOTO 20
 70:INPUT "# WKS (1-12)? ";B
 80:IF (B<1)+(B>12)+(B<>INT B)GOSUB 110:GOTO 70
 90:INPUT "BKDN? ";C:END
110:PRINT "ERROR":RETURN
130"D"IF A$="B"GOSUB 170:GOSUB 190
140:IF A$="D"GOSUB 170
150:IF A$="T"GOSUB 190
160:D=D+1:END
170:INPUT "DIST? ";I:E=E+I:RETURN
190:K=0:INPUT "TIME? ";K
200:J=INT K:K=(K-J)*100:I=INT (J/60):J=J-I*60
210:IF(K<>INT K)+(I>24)GOSUB 110:GOTO 190
250:I=I+F:J=J+G:K=K+H:GOSUB 270:F=I:G=J:H=K:RETURN
270:IF K>59LET K=K-60 J=J+1:GOTO 270
280:IF J>59LET J=J-60:I=I+1:GOTO 280
282:IF K<0LET K=K+60:J=J-1:GOTO 282
284:IF J<0LET J=J+60:I=I-1:GOTO 284
290:RETURN
410:"F"GOSUB 700:IF A$="T"GOSUB 550:GOTO 450
420:GOSUB 460:IF A$="B"GOSUB 550
450:D=0:E=0:F=0:G=0:H=0:END
460:I=E:IF B>1LET R=19:GOSUB 540
470:A(20)=E:USING "#####.##":PRINT "THIS WK";E
490:P=E/D:PRINT "AVE";P:P=P*C:PRINT "TO DT";L
500:PRINT USING "###";B;USING "#####.##";" WKS";I:IF C<1LET P=I*C
530:PRINT "BKDN";P:RETURN
540:FOR P=R+BTO R+2STEP -1:A(P)=A(P-1):I=I+A(P):NEXT P:RETURN
550:I=0:S=10[6:IF B>1LET R=31:GOSUB 540
555:P=I:I=INT (P/S):P=P-I*S:J=INT (P/1000):K=P-J*1000+H
557:I=I+F:J=J+G:GOSUB 270
560:A(32)=F*S+G*1000+H:USING "###":Q$=":"
570:PRINT "THIS WK";F;Q$;G;Q$;H
580:E=(H+G*60+F*3600)/D:GOSUB 680
590:PRINT "AVE";F;Q$;G;Q$;H:E=H+G*60+F*3600
610:GOSUB 750:PRINT B;" WKS";I;Q$;J;Q$;K
620:IF C<1LET E=K+J*60+I*3600
630:E=E*C:GOSUB 680:PRINT "BKDN";F;Q$;G;Q$;H:RETURN
680:F=INT (E/3600):E=E-F*3600:G=INT (E/60):H=INT (E-G*60):RETURN
700:L=L+E:I=M+F:J=N+G:K=O+H:GOSUB 270:M=I:N=J:O=K:RETURN
710:"B"GOSUB 700:IF A$="T"GOTO 730
720:PRINT "TO DT";USING "#####.##";L:L=-E:IF A$="D"END
730:Q$=":":GOSUB 750:M=-F:N=-G:O=-H:END
750:PRINT "TO DT";USING "####";M;USING "###";Q$;N;Q$;O:RETURN
```

Program Listing 1

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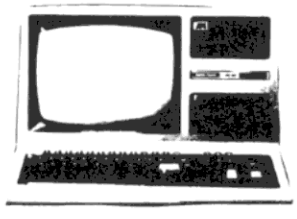

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"If you alter the program you must leave at least 17 memories available."

the breakdown point.

To set up these values run the initialization portion of the program. Begin with the weekly totals you have figured for the last weeks. Enter the earliest weekly total as a daily total and run the weekly total routine. Repeat the process for each week.

At this point the totals for the last N weeks are correct. If there have been only N weeks in the year so far, the year-to-date totals are also correct.

If there have been more than N weeks in the year adjust the year-to-date value by entering L. Set it to the correct value by typing L = XXX.XX where XXX.XX is the correct mileage.

The variables M, N and O are the year-to-date hours, minutes and seconds, respectively. Alter them as you did miles.

Save the variables A$, B-H, L-O and A(20)-A(43) before running other programs (see Table 1).■

A$	Option (T = Time, D = Distance, B = Both)
B	Number of weeks to save
C	Breakdown factor
D	Number of days exercised so far in current week
E	Total miles, current week
F	Total hours, current week
G	Total minutes, current week
H	Total seconds, current week
I	Miles or hours, current day miles or hours, during weekly total
J	Minutes corresponding to hours in I
K	Seconds corresponding to hours in I
L	Year-to-date total miles
M	Year-to-date total time (hours)
N	Year-to-date total time (minutes)
O	Year-to-date total time (seconds)
P	General purpose
Q$	Colon for displaying time
R	Maintenance of weekly totals
S	Constant 1,000,000
A(20)-A(31)	Miles, current week A(20) through 11 weeks ago A(31)
A(32)-A(43)	Time, current week A(31) through 11 weeks ago A(43)

Table 1. Program Variables.

Lines	Functions
10-90	Initialization. Get option (time, distance, both) and check it. Get number of weekly totals to be saved and check it. Get breakdown factor.
100	Display Error message.
130-160	Daily routine. Get distance, time, or both. Increment number of days.
170	Get daily distance and add it to the total for the current week.
190-250	Get daily time in the form MM.SS. Convert to hours, minutes and seconds and check the validity of the result. Add to the total for the current week. Call subroutine to adjust the total if minutes or seconds exceed 59.
270-290	Adjust time so minutes and seconds are in the range 0-59.
410-450	Finish a week. Add the week's total to the year-to-date total. Call separate routine to display the summaries for distance and time. Reset the totals for the next week.
460-530	Print the weekly summary for distance.
540	Shift the saved weekly totals, dropping the earliest week to make room for the current week.
550-630	Display the weekly summary based on time.
680	Convert time in seconds to hours, minutes and seconds.
700	Add the current week's totals to the year-to-date totals adjusting the time if necessary.
710-730	Begin a new year. Add the current week's totals to the year-to-date totals. Display the year-to-date totals. Set the year-to-date totals to minus the current week's totals.
750	Display statement for the year-to-date total of time.

Table 2. Program Description.

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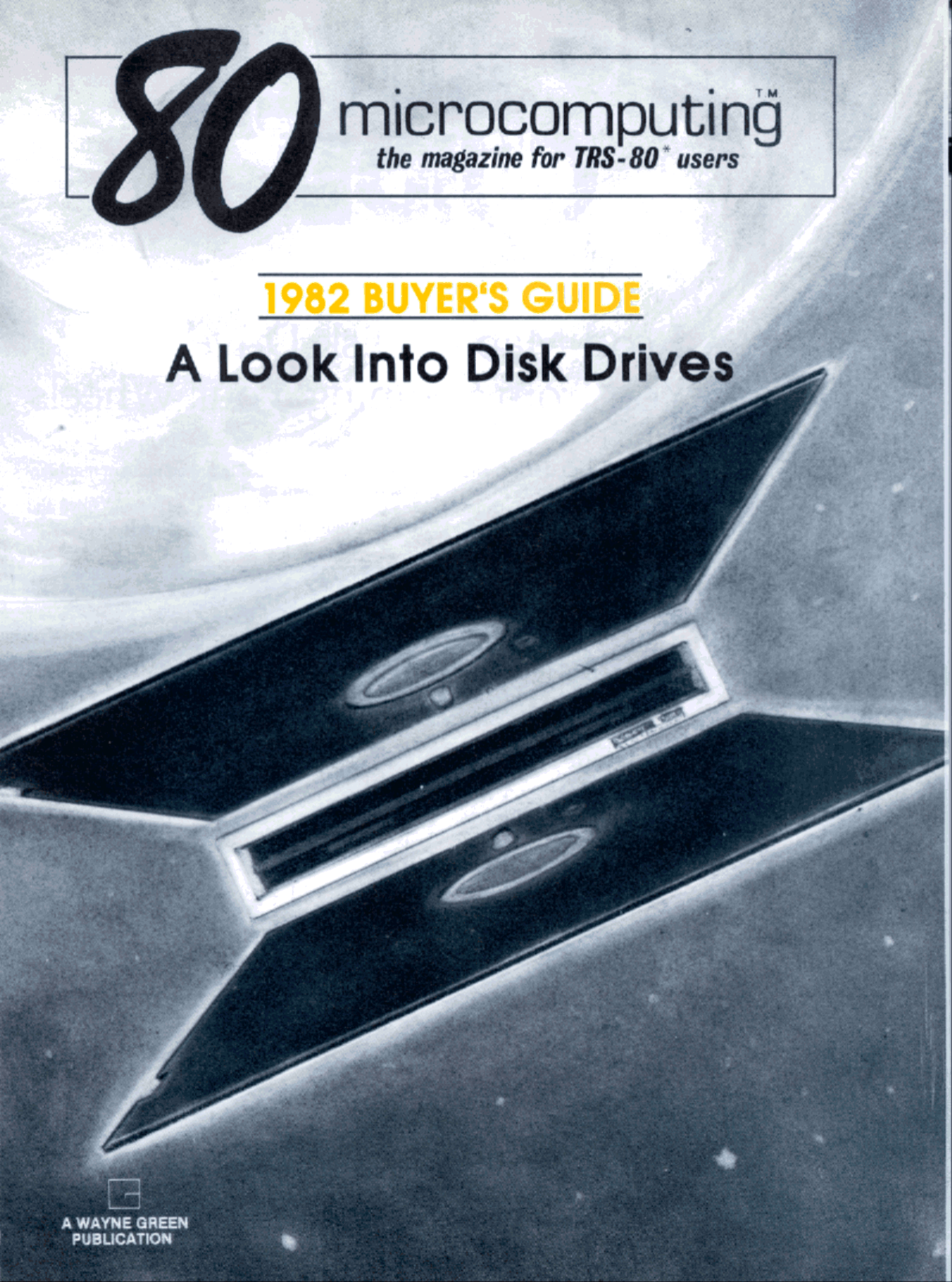
1982 BUYER'S GUIDE

A Look Into Disk Drives



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1982 BUYER'S GUIDE

A Road Map to Disk Drives To Keep You from Spinning Your Wheels

So you've finally called it quits with CLOADing and are ready to cough up the dough for disk drives. Which ones do I buy? you ask. After contacting more than 50 firms in the disk drive business, here are more than 60 models from 13 original equipment manufacturers, better known as OEMs.

The OEMs produce the "guts" of the disk drive and often sell them to other manufacturers for repack-

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	TEAC	FD-50A	$298	I, III	5.25	F	163.84
$300 to $399	Pertec	FD 200	$300	I, III	5.25	F	125*/250**
	MPI	51	$350	I, II, III	5.25	F	X
	Siemens	FDD 100-5	$350	OEM	5.25	F	81.9*
	Tandon	TM 100-1	$350	I, III	5.25	F	X
	MTI	E340	$359	III	5.25	F	105*
	BASF	6108-A	$375	I	5.25	F	X
	Shugart	SA 410	$395	OEM	5.25	F	204.8*/409.6**
	Percom	TFD-40	$399	I	5.25	F	102*/180**

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MPI
9754 Deering Ave.
Chatsworth, CA 91311
213-709-4202

PerCom Data
211 N Kirby
Garland, TX 75042
214-272-3421/800-527-1592

Pertec Computer Corp.
Peripherals
9600 Irondale Ave.
Chatsworth, CA 91311
213-999-2020

Qume Corp.
2350 Qume Dr.
San Jose, CA 95131
408-942-4000

Shugart Associates
435 Oakmead Parkway
Sunnyvale, CA 94086
408-733-0100

Siemens Corp.
186 Wood Ave. S.
Iselin, NJ 08830
201-494-1000

Tandon Corporation
9333 Oso Ave.
Chatsworth, CA 91311
213-993-6644

TEAC
7733 Telegraph
Montebello, CA 90640
213-726-0303

	Tracks	Track to track access in milliseconds	Transfer rate in K bits/sec.	Head life in contact hours	Media life in passes	Time between repairs in power-on hours	Dimensions in inches/ weight in pounds	Warranties	Comments	
	40	6	125*/250**	40,000	NA	10,000	2.1×5.75×7.5 3.1	A	K	$0 to $299
	40	6	125*/250**	U	3.6 million	8,000	6×11.5×3.5 10	B	—	
	40	25	250	10,000	U	8,000	5.75×7.99×3.25 3.75	A	L	
	40	25	125	20,000	3 million	8,000	5.75×8.0×3.25	C	M	$300 to $399
	40	5	125*/250**	20,000	3 million	9,200	5.75×7.75×3.25 3.5	D	—	
	40	20	125*/250*	15,000	3 million	8,500	5.75×3.25×8 3.5	B	—	
	40	5	125*/250**	20,000	4 million	8,000	5.75×8.0×3.25 4.5	B	—	
	40	6	175*/200**	X	3.6 million	8,000	6×11.5×3.5 10	B	—	
	40	9	125*/250**	5 yrs.	X	10,000	5.75×7.5×2.1 3.1	A	N	
	80	6	125*/250**	X	X	8,000	5.75×8.25×3.25 3.2	E	—	
	40	10	X	20,000	3 million	9,200	5.75×7.6×3.2 3.5	B	O	

M = 5 and 12 volt power supplies
N = double-headed drive
O = illustrated users manual
P = needs software mods. for compatibility with TRS-80
Q = DC-only operation
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S = multiplex capability
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V = electronic door lock
W = Winchester technology
Y = four drive heads
Z = intelligent controller
AA = Western Dynex drive/Cameo controller
BB = Control Data Corp. drive/Cameo controller

	Company	Model	Price	For TRS-80 Model	Disk size in inches	Floppy (F)/Rigid (R)	Storage in formatted K
$400 to $499	Qume	QT542	$400	OEM	5.25	F	286.7
	TEAC	FD-50E	$410	I, III	5.25	F	327.68
	TEAC	FD-50C	$410	I, III	5.25	F	315.392
	Tandon	TM100-2	$425	I, III	5.25	F	X
	Tandon	TM100-3	$425	I, III	5.25	F	X
	Percom	TFD-42	$439	I, III	5.25	F	102*/180**
	MPI	52	$450	I, II, III	5.25	F	X
	MPI	91	$450	I, II, III	5.25	F	X
	Siemens	FDD 200-5	$450	OEM	5.25	F	X
	TEAC	FD-50B	$450	I, III	5.25	F	327.68
	Shugart	SA 450	$450	OEM	5.25	F	204.8*/409.6**
	Pertec	FD 250	$455	III	5.25	F	250*/500**
	Qume	QT 592	$465	OEM	5.25	F	800
	Shugart	SA 460	$495	OEM	5.25	F	409.6*/819.2**
	TEAC	FD-50F	$495	I, III	5.25	F	655.36
	MTI	E34D40	$499	III	5.25	F	105*/210**
$500 to $599	Tandon	TM100-4	$500	I, III	5.25	F	X
	MTI	TF-13	$509	I	5.25	F	210**
	Tandon	TM848-1	$530	II	5.25	F	600*/1200**
	MPI	92	$550	I, II, III	5.25	F	X
	Percom	TFD-80	$559.95	I	5.25	F	205*
	Shugart	SA 801	$575	OEM	8	F	256*/630**
	Siemens	FDD 100-8	$580	OEM	8	F	256

* = single density
** = double density
X = unavailable
NA = not applicable

A = 1 yr. parts and labor
B = 90 d. parts and labor
C = 6 mos. parts and labor
D = 90 d. FOB
E = 45 d. replacement; 1 yr. parts
F = 90 d. replacement; 1 yr. parts

G = dealer determined
H = service contract available
I = 90 d. return to mfc.
J = 1 yr. return to mfc.
K = standard interface
L = single sided

Tracks	Track to track time in milliseconds	Transfer rate in K bits/sec	Head life in power hours	Media life in passes	Time between reads to preserve data	Dimensions in inches; weight in pounds	Warranty	Comments	
40	12	250	X	3.5 million	8,000	5.87 × 8.0 × 3.375	G	—	$400 to $499
80	10	250	10,000	X	8,000	5.75 × 7.99 × 3.25 3.75	A	—	
77	25	250	10,000	X	8,000	5.75 × 7.99 × 3.25 3.75	A	—	
80	5	125*/250**	20,000	4 million	8,000	5.75 × 8.0 × 3.25	B	P	
80	3	125*/250**	20,000	4 million	8,000	5.75 × 8.0 × 3.25	B	P	
40	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O	
40	5	125*/250**	20,000	3 million	9200	5.75 × 7.75 × 3.25 3.5	D	N	
80	5	125*/250**	20,000	3 million	9200	5.75 × 7.75 × 3.25 3.1	D	—	
40	20	125*/250**	15,000	3 million	8,500	5.75 × 8.0 × 3.25 3.5	A	—	
40	25	250	10,000	X	8,000	5.75 × 7.99 × 3.25 3.75	A	—	
40	20	125*/250*	X	X	8,000	5.75 × 8.25 × 3.25 3	E	N	
70	25	250	20,000	3 million	8,000	5.75 × 8.0 × 3.25 3.2	C	M	
80	3	250	X	3.5 million	8,000	5.87 × 8.0 × 3.375	G	—	
80	6	125*/125*	X	X	8,000	5.75 × 8.25 × 3.25 3.2	E	—	
80	10	250	10,000	X	8,000	5.75 × 7.99 × 3.25 3.75	A	—	
40	6	125*/250**	X	X	11,000	6.0 × 11.5 × 3.5 10	B	—	

aging and modification. For example, a firm like Matchless Systems in Gardena, CA, modifies Shugart eight-inch drives and Qume five-and-a-quarter-inch double-sided drives then sells them under the Matchless name.

For some entries in the buyer's guide, you will find in the "For TRS-80 Model" category OEM. That means the firm's drives are incompatible with the Radio Shack micro but are sold to firms making modifications necessary for compatibility. This is the case with Cameo Electronics. It installs the Western Digital

160	3	125*/250**	20,000	4 million	8,000	5.75 × 8.0 × 3.25	B	N,P	$500 to $599
40	6	125*/250**	X	3.6 million	8,000	6.0 × 11.5 × 3.5 10	B	N	
77	3	250*/500**	20,000	X	10,000	8.55 × 13.125 × 2.3 5.5	B	K,Q	
80	5	125*/250**	20,000	3 million	9200	5.75 × 7.75 × 3.25 3.5	D	N	
80	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O	
77	8	250*/500	X	X	8,000	9.50 × 14.25 × 4.62 13	E	K,R,S	
77	3	250*/500**	15,000	3 million	6,000	8.55 × 14.25 × 4.5 13	B	—	

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T=internal drive
U=AC and DC power supplies
V=electronic door lock
W=Winchester technology
Y=four drive heads
Z=intelligent controller
AA=Western Dynex drive/Cameo controller
BB=Control Data Corp. drive/Cameo controller

	Company	Model	Price	For TRS-80 Model	Disk size in inches	Floppy (F)/Rigid (R)	Storage in formatted K
$600 to $799	Percom	TFD-82	$620	I, III	5.25	F	205*
	Tandon	TM848-2	$635	OEM	8	F	629*/1,250**
	MTI	E3D80	$659	III	5.25	F	105*/210**
	MTI	TF-15	$659	I	5.25	F	105*/210**
	Siemens	FDD 200-8	$700	OEM	8	F	512**
	Percom	TFD-342N	$749.95	III	5.25	F	102*/180**
	Percom	TFD-40	$795	I	5.25	F	180**
$800 to $999	Shugart	SA 851	$800	II	8	F	606*/1,212*
	Shugart	SA 602	$800	OEM	8	R	2600
	Qume	QT 842	$808	OEM	8	F	1,200
	MTI	TF-17	$859	I	5.25	F	105*/210**
	Pertec	FD 650	$875	OEM	8	F	X
	Percom	TFD-42	$878	I, III	5.25	F	180**
	MTI	MTI-8	$949	III	8	F	486
$1000 to $1499	Percom	TFD-80	$1114.90	I	5.25	F	364**
	Percom	TFD-342N	$1148.95	III	5.25	F	102*/180**
	Percom	TFD-342X	$1148.95	III	5.25	F	102*/180**
	Percom	TFD-82	$1230	I, III	5.25	F	364**
$1500 to $1999	Hewlitt-Packard	82902	$1500	OEM	5.25	F	X
	Shugart	SA 604	$1580	OEM	5.25	R	2600
	Shugart	SA 1002	$1600	OEM	8	R	4200
	Shugart	SA 1004	$1980	OEM	8	R	4200

All specs released by a manufacturer are subject to what is slyly called "specsmanship."

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E = 45 d. replacement; 1 yr. parts
F = 90 d. replacement; 1 yr. parts

G = dealer determined
H = service contract available
I = 90 d. return to mfc.
J = 1 yr. return to mfc.
K = standard interface
L = single sided

Tracks	Track to track access in milliseconds	Transfer rate in K bits/sec.	Head life in contact hours	Media life in passes	Time between repairs in power-on hours	Dimensions in inches/ weight in pounds	Warranties	Comments	
80	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O	$600 to $799
154	3	250*/500**	X	X	10,000	8.55 × 13.125 × 2.3 5.5	B	K,Q	
80	6	700	X	3.6 million	8,000	6.0 × 11.5 × 3.5 10	B	N	
80	6	125*/250**	X	3.6 million	8,000	6.0 × 11.5 × 3.5 10	B	—	
77	3	250*/500**	15,000	3 million	6,000	8.55 × 14.25 × 4.5 13	B	—	
40	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O,T	
40	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O	
80	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O	$800 to $999
154	8	250*/500**	X	X	8,000	9.50 × 14.25 × 4.62 13	E	N	
77	3	500	X	3.5 million	8,500	8.5 × 15 × 4.5	G	—	
80	6	420	X	3.6 million	8,000	6.0 × 11.5 × 3.5 10	B	N	
154	3	250*/500**	20,000	3 million	10,000	8.55 × 14 × 4.5 13	C	N,U,V	
40	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O	
77	8	250	X	2.5 million	8,000	9 × 18 × 5 13	B		

chip needed to make Western Dynex and Control Data Corp. cartridge disk drives compatible with the TRS-80 Models I and II.

Tandy Corporation makes and buys its disk drives. Its 5.25-inch drives are manufactured by a company, Texas Peripherals, that makes drives only for Tandy. Recently it ordered $25 million worth of disk drives from the Tandon Corporation. At the time, the firms

80	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O	$1000 to $1499
40	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O,T	
40	10	X	20,000	3 million	9,200	5.75 × 7.6 × 3.2 3.5	B	O,T	
320	3	5000	X	2 million	8,000	5.75 × 8.25 × 8.25 3.5	E	W	
X	X	X	X	3 million	U	11 × 15 × 4 U	H	—	$1500 to $1999
320	3	5000	X	NA	8,000	5.75 × 8.25 × 3.25 3.5	E	W	
512	1	4340	X	NA	8,000	9.50 × 14.25 × 4.62 17	E	W	
1024	1	4340	X	NA	8,000	9.50 × 14.25 × 4.62 17	E	W	

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Y = four drive heads
Z = intelligent controller
AA = Western Dynex drive/Cameo controller
BB = Control Data Corp. drive/Cameo controller

	Company	Model	Price	For TRS-80 Model	Disk size in inches	Floppy (F)/Rigid (R)	Storage in formatted K
$2000 to $3500	Hewlitt-Packard	82901	$2500	OEM	5.25	F	X
	MTI	ES	$2799	III	5.25	R	X
	MTI	E7.5	$3100	III	5.25	R	X
	Hewlitt-Packard	9885	$3500	OEM	8	F	X

"Some companies try to be simple and direct, while others make their specs as appealing as possible by having a unique definition."

were unwilling to divulge which Tandon drive was being sold to Radio Shack. However, a source at Tandon said that firm would be supplying eight-inch drives for the TRS-80 Model II. The source added Tandy intended to install two drives in the Model II cabinet. Currently, that micro comes with only one drive in the cabinet.

Tandy and Persci Inc. of Los Angeles were unable to get their disk drive information to *80 Micro* before the deadline for the buyer's guide expired.

Although the Sony Corporation doesn't sell disk drives compatible with TRS-80s, a spokesperson for the Japanese firm said it was considering marketing its disk drives in the United States like other OEMs.

A word of caution to all potential disk drive buyers, however. All specs released by a manufacturer are subject to what is slyly called "specsmanship." In a BASF "Applications Note," Robert J. Stetson, an applications engineer with that firm's computer hard-

more than $3500	Shugart	SA 4008	$3600	OEM	14	R	24,800
	Corvus	5XX	$3750	I, II, III	5.25	R	5700
	Hewlitt-Packard	9895	$4000	OEM	8	F	X
	Corvus	11XX	$5350	I, II, III	8	R	10,500
	Cameo	6000	$5995	I, II	14	R	10,000
	Corvus	20XX	$6450	I, II, III	8	R	18,600
	Cameo	9427	$7995	I, II	14	R	10,000

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C = 6 mos. parts and labor
D = 90 d. FOB
E = 45 d. replacement; 1 yr. parts
F = 90 d. replacement; 1 yr. parts

G = dealer determined
H = service contract available
I = 90 d. return to mfc.
J = 1 yr. return to mfc.
K = standard interface
L = single sided

Tracks	Track to track access in milliseconds	Transfer rate in K bits/sec.	Head life in contact hours	Media life in passes	Time between repairs in power-on hours	Dimensions in inches/ weight in pounds	Warranties	Comments	
70	187	X	X	X	X	15 × 17 × 4	H	—	$2000 to $3500
612	3	5000	X	NA	11,000	11.5 × 13.5 × 5.5 10	B	W,Y	
918	3	5000	X	NA	11,000	11.5 × 13.5 × 5.5 17	B	W,Y	
X	267	X	X	3 million	X	17 × 17 × 5	H	—	

A source at Tandon said that firm would be supplying eight-inch drives for the TRS-80 Model II.

ware department, said of specsmanship:

"The first rule is that any term or specification can be defined a dozen ways. Some companies try to be simple and direct, while others make their specs as appealing as possible by having a unique definition. Specs are like statistics—you can always make them more appealing by redefining the method for obtaining the results."

Stetson went on to write:

"If any disparities or obvious discrepancies are discovered, check with the drive manufacturers' sales or applications personnel. Their engineers have seen hundreds of applications and evaluations, and can be a valuable source of knowledge. It is a free resource that you can draw upon and there are no strings attached.

"Above all, give them each a fair shot at your business." ■

1.616	1	7100	X	NA	8,000	16.6 × 21.9 × 5.22 35	B	W	more than $3500
X	43	425	10,000	NA	10,000	14.5 × 15 × 5.3	C	W,Z	
X	3	X	X	3 million	X	19 × 22 × 7.6	H	—	
X	10	425	10,000	NA	10,000	14.5 × 15 × 6.375	C	W,Z	
814	10	X	X	NA	5,000	18 × 28 × 8.75 128	I	AA	
U	10	425	10,000	NA	10,000	14.5 × 15 × 5.3	C	W,Z	
406	7-65	X	X	NA	X	19 × 28.63 × 10.31 127	J	BB	

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Automatic accrual convenience. The system automatically reverses accrual entries made in the previous period. This simplifies adjusting accounts and improves control.

Simple data throughput. The facility of next-period processing lets you enter next-period transactions before the present period closes. This raises data throughput and allows adjustments to be made in the current period.

Simple seasonal comparisons. The system can maintain details of activities period by period so that comparisons of this year/last year, for example, are quite straightforward.

Account file inquiries on all accounts. You can probe where and when you want. The system will display current and historic budget details, current and prior-period movement, year-to-date balances, all on a single screen display or in a printout.

Transaction file information facility. With over 60 selection options at your disposal, this is a very powerful enquiry feature. Again, the information can be displayed or printed.

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A batching facility. There is a built-in technique for controlling input so that all transactions can be batched.

Optimum management control. This system can hold up to 99 separate report riles, each containing up to 9 sub reports. They can draw upon all data on the master files and can be changed or modified as and when you wish.

Typically, standard reports such as trial balances are preprogrammed. But profit and loss statements, cost centre activity, income statements, representative reports, balance sheets and the like can be set out as you want them.

The implications of this for management decision-making are obvious.

Balancing controls. Sophisticated validation techniques ensure the integrity of input data.

Limitless flexibility. Standard ledger accounting is only the start. Depending on how the structure of accounts is designed, the system can undertake project accounting, job/project costing, sales analysis, contract ledger accounting, incomplete record accounting, etc.

Growth capacity. Not every user will need all these functions from the outset. But most features are potentially applicable to most businesses. With such capacities inherent in the system right from the start, you can avoid complexities later.

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A new technique for building graphic strings.

Alpha-Graphics

Larry Basch
6149 Shear Road
Saugerties, NY 12477

Like most TRS-80 owners, you have probably tried your hand at animation. Immediately you learned the graphics taught in the manual ran so lackadaisically they were only good for animating tortoise races. None could draw anything more complicated than lines. To construct something interesting you could form a string using CHR$(128) to CHR$(191). It worked well. The program ran with pep and once assembled, a figure could be drawn using a single print-at statement. That, however, took stupendous quantities of graphics blocks. At that point you may have decided not to bother with TRS-80 graphics.

But now there is a new technique for building the strings, reducing the drudgery immensely. I call it alpha-graphics.

Take a look at Samples 1-3. These show string writing programs for a vertical line one space wide by five spaces high using normal string graphics, string packing, and alpha-graphics.

String Methods

Before explaining alpha-graphics, let me review the pros and cons of the existing string methods. The first challenge is to draw your figure with only 64 graphics characters and any other handy symbols on the keyboard. This is not a hardship, but a test of your ability to think abstractly. When you complete the drawing, the tedium begins. All those character strings have to be glued together so the figure can move on the screen. If each string had to be moved individually, animation would be back at the level taught in the manual. By having the figure in one string (or possibly several sub-strings), it can be moved easily by writing a simple loop to drive Print@ X,A$.

The most straightforward way to assemble the strings is to concatenate the character strings one after the other (see Example 1). A solid block one space long by one space high is printed by CHR$(191), then CHR$(24) and CHR$(26), backspace and lower the cursor so the following block is printed beneath the first.

The advantage of this method is its simplicity. A beginning programmer can understand it easily, but even he quickly spots a major drawback. For a figure of any complexity, you have to type and type and type.

String packing reduces the typing load considerably. In string packing, a dummy string is set up with the same number of characters as in the desired graphics string. The code numbers of the graphics characters required are read from a data statement, then POKEd into the dummy string to replace the characters there (see Example 2).

It's a clever approach and saves a lot of memory. But its cleverness leads to problems. String packing is not forgiving. Once the program runs and the POKEing takes place, it is nearly impossible to make changes. Just trying to List uncovers hidden errors. Any clumsy move by the programmer can result in a real crash.

For smaller strings, packing may not save memory. The bytes saved by typing the code number—and not the CHR ( )— are offset by the memory used in the Read...POKE loop. Another inefficiency is the loss of the STRING$ function. To print a solid line 24 spaces long requires a statement with 24 191s in a row.

Overall, however, string packing can save about ⅓ of the memory used by adding character strings, and so is the only choice if the animation is complex enough. Program development can be very painful, though, especially in the early stages, when you are deciding what looks good on the screen.

Alpha-Graphics

Both standard string graphics and string packing require more work than I find comfortable. When I was forced to look for an easier way, two criteria seemed important. Typing should be minimal and changing one's mind should be as easy as possible. Saving memory would be a fringe benefit.

After a little thought, I realized adding character strings has a lot going for it. For simplicity, clarity and ease of editing, it's very good. The biggest problem is the way in which the symbols are defined. CHR$(128) is a hard way to say "space." What if much shorter symbols could be used to access the graphics characters? Then simple concatenation would be the most economical way to build strings, and the complexities of string packing could be avoided.

My first notion was to load an array but that didn't look like an improvement. Since the shortest possible symbol representing one of 64 characters is two digits long, a two keystroke symbol was my goal. The next approach seemed more promising. All vari-

able names in Level II Basic must have a letter as the first character. Why not use a series of two letter names such as AA$ = CHR$(128), AB$ = CHR$(129), AC$ = CHR $(130)? By using a DEFSTR A-C statement, this could be reduced to AA = CHR$(128), AB = CHR$(129) . . . CL = CHR$ (191). The leftover symbols from CM to CZ could be used for cursor movements, control characters, and other things.

Writing a loop to generate these substitutions turned out to be harder than I thought. Level II did not take kindly to having a variable name with CHR$(xxx) embedded in it.

Since my goal was to define 78 variables, what more positive way than to write 78 individual program statements (Program Listing 1)?

The first step in using alpha-graphics is to take your Level II reference manual and print the new symbols next to the graphics characters. Next, you will have to spend about 15 minutes entering the definition statements into memory. Once the alpha-graphics foundation program is on tape, CLOADing it becomes the first step in any new graphics animation. Change the size of the Clear statement in line 10 if need be, then build your own program on top of the foundation—strings are constructed in the same fashion as in adding character strings.

Other Functions

Table 1 shows the functions I chose for the leftover symbols CM-CZ. These struck me as the most useful, but your preferences may differ. One handy feature is the ability to create compound characters, such as CT and CU, combining cursor backspacing with a linefeed. These simplify getting the cursor to the start of a new line in a multi-line figure. Of course, STRING$ can also be used for backspacing. Alpha-graphics symbols mix with STRING$ very nicely.

Program Listing 2 is a short demonstration of all this in action. It sets up the strings for the graphics of a man pacing endlessly back and forth in a room. Note the body string is the same regardless of the direction he is traveling. Only the head

```
10 A$ = CHR$(191) + CHR$(24) + CHR$(26) + CHR$(191) + CHR$(24) +
        CHR$(26) + CHR$(191) + CHR$(24) + CHR$(26) + CHR$(191) +
        CHR$(24) + CHR$(26) + CHR$(191)
```

Sample 1. Normal String Graphics.

```
10 A$ = "NEW YORK METS"
20 DATA 191,24,26,191,24,26,191,24,26,191,24,26,191
30 Z = PEEK(VARPTR(A$) + 2)*256 + PEEK(VARPTR(A$) + 1)
40 FOR K = Z TO Z + 13
50 READ G
60 POKE K,G
70 NEXT K
```

Sample 2. String Packing.

```
10 A$ = CL + CT + CL + CT + CL + CT + CL + CT + CL
```

Sample 3. Alpha-graphics.

```
CM  blank space (one)
CN  "       "   (two)
CO  "       "   (four)

CP  backspace cursor (one)
CQ  "              "   (two)
CR  "              "   (four)
CS  "              "   (eight)
CT  backspace cursor(one) + cursor down
CU   "     "          (two)     "      "


CV  cursor forward
CW cursor up
CX  cursor down

CY  erase to end of line
CZ  erase to end of frame
```

Table 1. Alpha-graphics cursor control and utility symbols.

```
1    REM----ALPHA-GRAPHICS FOUNDATION PROGRAM----
10   CLEAR 1000
100  DEFSTR A-C
110  AA=CHR$(128):AB=CHR$(129):AC=CHR$(130):AD=CHR$(131):
     AE=CHR$(132):AF=CHR$(133):AG=CHR$(134):AH=CHR$(135):
     AI=CHR$(136):AJ=CHR$(137):AK=CHR$(138):AL=CHR$(139):
     AM=CHR$(140):AN=CHR$(141):AO=CHR$(142):AP=CHR$(143):
120  AQ=CHR$(144):AR=CHR$(145):AS=CHR$(146):AT=CHR$(147):
     AU=CHR$(148):AV=CHR$(149):AW=CHR$(150):AX=CHR$(151):
     AY=CHR$(152):AZ=CHR$(153)
130  BA=CHR$(154):BB=CHR$(155):BC=CHR$(156):BD=CHR$(157):
     BE=CHR$(158):BF=CHR$(159):BG=CHR$(160):BH=CHR$(161):
     BI=CHR$(162):BJ=CHR$(163):BK=CHR$(164):BL=CHR$(165):
     BM=CHR$(166):BN=CHR$(167):BO=CHR$(168):BP=CHR$(169):
140  BQ=CHR$(170):BR=CHR$(171):BS=CHR$(172):BT=CHR$(173):
     BU=CHR$(174):BV=CHR$(175):BW=CHR$(176):BX=CHR$(177):
     BY=CHR$(178):BZ=CHR$(179)
150  CA=CHR$(180):CB=CHR$(181):CC=CHR$(182):CD=CHR$(183):
     CE=CHR$(184):CF=CHR$(185):CG=CHR$(186):CH=CHR$(187):
     CI=CHR$(188):CJ=CHR$(189):CK=CHR$(190):CL=CHR$(191):
     CM=CHR$(193):CN=CHR$(194):CO=CHR$(196):CP=CHR$(24):
160  CQ=STRING$(2,24):CR=STRING$(4,24):CS=STRING$(8,24):
     CX=CHR$(26):CT=CP+CX:CU=CQ+CX:CV=CHR$(25):CW=CHR$(27):
     CY=CHR$(30):CZ=CHR$(31)
```

Program Listing 1. Alpha-graphics Foundation.

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changes direction. The intermediate position of the body (with the arms and legs straight) is needed to create the impression that the man is actually walking. Try it without that position and depending on the increment he moves, he will appear to be either hopping or on roller skates.

Memory Use

Most graphics programs need every byte they can get. The alpha-graphics foundation program costs quite a bit of memory by itself—about 1.3K to be exact. However, alpha-graphics is so stingy of memory in actual use, this is soon paid for. To use a CHR$(130) in a string requires seven bytes—CHR$ (which is stored as a one-byte token), and one byte apiece for the "(,1,3,0,)" in program memory, plus the seventh byte in string memory for binary 130. By comparison, the same character in alpha-graphics takes only three bytes—"A,C" in program memory and the same byte for binary 130 in string memory. This is even less than string packing, which requires four bytes—"1,3,0" in the data statement plus one for the string. In addition, string packing has overhead from the extra statements used in POKEing the values into the dummy string.

A typical animation creature might require 50 or so graphics blocks. This would be a fair compromise between an object too small for detail and one too large to have any room left for movement on the screen. Depending on the actual figure, if the string were written by adding character strings it might need 500 bytes for the characters and cursor movements. The same string formed by string packing would probably use 400 bytes, but the alpha-graphics string would get by with 250. With savings like these, it would not take long to pay back the 1.3K used by the foundation program.

Memory saving isn't the real reason I like alpha-graphics, though. It's because it's so easy. Admittedly, purists will find the whole approach inelegant, but if I have to choose between elegance and ease, I'll put my feet up on the desk every time. Alpha-graphics saves time and effort, reduces errors, and gets more animation into a given RAM. What more could you want? ■

```
20   CLS: PRINT@205, CHR$(23); "ALPHA-GRAPHICS"
30   PRINT@270, "DEMONSTRATION"
40   PRINT@582, "---THE WORRIED MAN---"

200  REM---STRING FOR BODY WITH LIMBS EXTENDED---
210  LE$=AA+BG+CI+CL+CI+AQ+AA+CR+CQ+CT+AA+AB+BJ+CL+AT+
       AC+AA+CR+CU+AA+AD+AA+AD+AA

220  REM---STRING FOR BODY WITH LIMBS STRAIGHT---
230  LS$=AA+AA+CI+CL+CI+AA+AA+CR+CQ+CT+AA+AA+AD+CL+AD+
       AA+AA+CR+CU+AA+AA+AD+AA+AA

240  REM---STRING FOR HEAD FACING RIGHT---
250  HR$=AA+BQ+CD+CL+CL+AE+AA+CR+CQ+CT

260  REM---STRING FOR HEAD FACING LEFT---
270  HL$=AA+AI+CL+CL+CH+AV+AA+CR+CQ+CT

300  REM---VERTICAL STRING FOR WALL---
310  W$= CL+CT+CL+CT+CL+CT+CL+CT+CL+CT+CL+CT+CL+CT+CL+CT+
       CL+CT+CL+CT+CL+CT+CL

400  REM---DRAW ROOM---
410  CLS: PRINT@70, STRING$(50,131)+W$
420  PRINT@69, W$+STRING$(50, 176)

500  REM---WALK RIGHT---
510  FOR J=462 TO 488 STEP 2
520  PRINT@J, HR$+LE$; : FOR T=1 TO 10:NEXT T
530  PRINT@J+1, HR$+LS$; : FOR T=1 TO 5: NEXT T
540  NEXT J

550  REM---WALK LEFT---
560  FOR J=488 TO 462 STEP-2
570  PRINT@J, HL$+LE$; : FOR T=1 TO 10: NEXT T
580  PRINT@J-1, HL$+LS$; : FOR T=1 TO 5 : NEXT T
590  NEXT J
600  GOTO 500
```

Program Listing 2. Statements to Animate Man Pacing.

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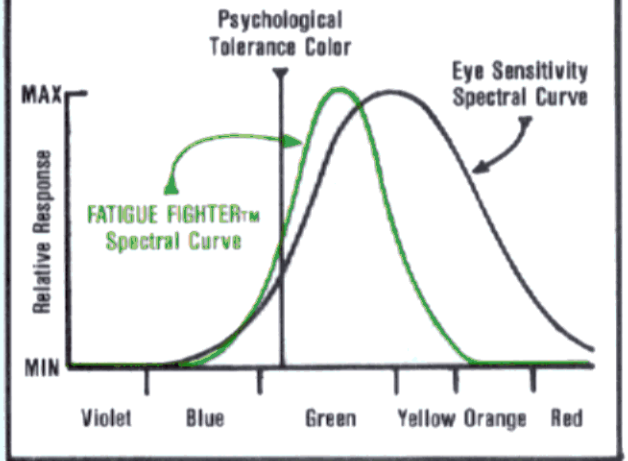

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NEATLIST

D. N. Ewart
121 Woodhaven Drive
Scotia, NY 12302

Neatlist is a formatter that prepares clean, easy-to-read listings on a 16K Model I. You can use Neatlist with any Level II Basic program.

Compare Program Listing 1 produced by Neatlist to Program Listing 2 obtained with the TRS-80's LLIST command. Using Neatlist, only one Basic statement appears on each line.

Neatlist fetches Basic keywords such as If, For and CLS, by PEEKing the TRS-80's compact internal code in ROM (read only memory). It uses the data in lines 65512–65514 to point to keyword locations.

To improve Listing 2, append it to Neatlist and type: RUN 65500. The screen will ask you for a title. Type one, and your printer does the rest. Neatlist reads your program a character at a time, then stops when it reaches line 65500, the start of its own instructions.

(You may wonder why line 65510 reads A$ until the string Neatlist is encountered. This has to be done to jump over any data statements in your program.)

The variables LM and RM specify the left and right margins for the listings. I equate these to five and 72, respectively, in line 65504, but you can change their values to suit your needs.

Variable S is a spacing control. Setting it to one inserts one space between numbered Basic lines and provides a nice appearance, but you can set S to zero if you wish. If you are prone to experimenting, modify the program to paginate, print portions of a program, or even indent subroutine calls and For...Next loops.

If you don't have a printer the program is still useful, but you'll have to delete the first instruction in line 65520, then change LPRINT to Print in lines 65520 and 65526. I'd also suggest changing RM to 62. Model III owners, set I = 17383 in line 65504. ■

Program Listing 1.

```
65500 REM  NEAT-LISTING PROGRAM  VER. 2.1   ATTACH TO ANY PROGRAM
           D.N.EWART  121 WOODHAVEN DRIVE, SCOTIA N.Y. 12302  12/18
           /80

65501 REM  TO USE, TYPE "RUN 65500"   LM IS LEFT MARGIN  RM IS RIGH
           T MARGIN  S IS # SPACES BETWEEN NUMBERED LINES

65504 CLS
      CLEAR 600
      DEFINT A - Z
      DIM K1(125)
      LM = 5
      RM = 72
      S = 1
      T1 = 5
      I = 17127
      GOSUB 65510
      PRINT @520,"";
      INPUT "TITLE";A$
      GOSUB 65524

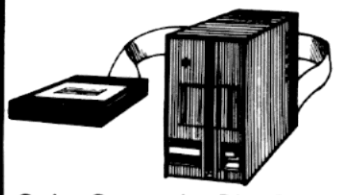
65505 I = I + 1
      D =  PEEK (I)
      IF D = 0 THEN P = 0
      GOSUB 65524
      LN! =  PEEK (I + 3) + 256 *  PEEK (I + 4)
      IF LN! = 65527 THEN  STOP
      ELSE  GOSUB 65520
      I = I + 4
      GOTO 65505
      ELSE  IF D = 58 THEN  IF P = 1 THEN 65506
      ELSE  GOSUB 65524
      GOTO 65505
      ELSE 65506

65506 IF D > 127 AND D < 254 THEN 65508
      ELSE  IF D = 34 AND P = 0 THEN P = 1
      ELSE  IF D = 34 AND P = 1 THEN P = 0
```

Program Listing 1 continues

From Computer Plus to YOU . . .

PLUS after PLUS after PLUS



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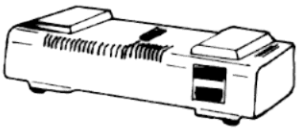

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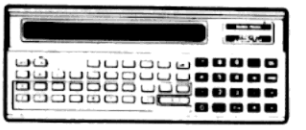

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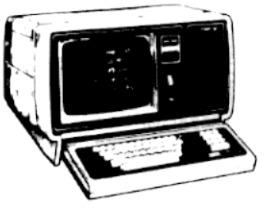

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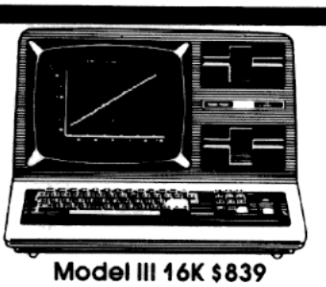

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Program Listing 1 continued

```
65507 A$ = A$ +  CHR$ (D)
      GOTO 65505

65508 K2 = K1(D - 128) + 5712
      A$ = A$ + " " +  CHR$ ( PEEK (K2) - 128)
      IF D = 147 THEN P = 1

65509 K2 = K2 + 1
      IF  PEEK (K2) > 128 THEN A$ = A$ + " "
      GOTO 65505
      ELSE A$ = A$ +  CHR$ ( PEEK (K2))
      GOTO 65509

65510 READ A$
      IF A$ <  > "NEATLIST" THEN 65510
      ELSE  FOR K = 0 TO 125
      READ K1(K)
      NEXT
      RETURN

65511 DATA "NEATLIST"

65512 DATA 0,3,6,11,14,17,20,26,30,34,39,42,46,49,53,56,58,65,70,76
      ,79,83,87,91,96,102,108,114,120,124,128,133,139,142,144,
      148,153,156,159,164,168,173,177,181,185,189,193,199,205,
      208,212,217,221,225,230,236,240,245,250,255,258,262,264,
      266,271

65513 DATA 277,280,283,286,293,298,303,308,311,317,321,324,328,329,
      330,331,332,333,336,338,339,340,341,344,347,350,353,356,
      359,362,365,368,371,374,377,380,383,387,390,393,396,399,
      402,405,409,413,417,421,425,429,432,435,439,442,445,449,
      454,460

65514 DATA 464,466,468

65520 LPRINT  STRING$ (S,138)
      LPRINT  TAB( LM) USING "&&&&&";LN!;
      RETURN

65524 R = 0
      IF  LEFT$ (A$,1) = " " THEN T = T1 + T2 + LM
      ELSE T = T1 + 1 + T2 + LM

65525 IF  LEN (A$) > RM - T THEN B$ =  LEFT$ (A$,RM - T)
      A$ =  RIGHT$ (A$, LEN (A$) - RM + T)
      R = 1
      T2 = 5
      ELSE B$ = A$

65526 LPRINT  TAB( T)B$
      IF R = 1 THEN 65524
      ELSE A$ = ""
      T2 = 0
      RETURN
```

```
65500 REM NEAT-LISTING PROGRAM  VER. 2.1   ATTACH TO ANY PROGRAM   D.N.EWART  12
1 WOODHAVEN DRIVE, SCOTIA N.Y. 12302  12/18/80
65501 REM TO USE, TYPE "RUN 65500"   LM IS LEFT MARGIN  RM IS RIGHT MARGIN  S IS
 # SPACES BETWEEN NUMBERED LINES
65504 CLS:CLEAR600:DEFINTA-Z:DIMK1(125):LM=5:RM=72:S=1:T1=5:I=17127:GOSUB65510:P
RINT@520,"";:INPUT"TITLE";A$:GOSUB65524
65505 I=I+1:D=PEEK(I):IFD=0THENP=0:GOSUB65524:LN!=PEEK(I+3)+256*PEEK(I+4):IFLN!=
65500THENSTOPELSEGOSUB65520:I=I+4:GOTO65505ELSEIFD=58THENIFP=1THEN65506ELSEGOSUB
65524:GOTO65505ELSE65506
65506 IFD>127ANDD<254THEN65508ELSEIFD=34ANDP=0THENP=1ELSEIFD=34ANDP=1THENP=0
65507 A$=A$+CHR$(D):GOTO65505
65508 K2=K1(D-128)+5712:A$=A$+" "+CHR$(PEEK(K2)-128):IFD=147THENP=1
65509 K2=K2+1:IFPEEK(K2)>128THENA$=A$+" ":GOTO65505ELSEA$=A$+CHR$(PEEK(K2)):GOTO
65509
65510 READA$:IFA$<>"NEATLIST"THEN65510ELSEFORK=0TO125:READK1(K):NEXT:RETURN
65511 DATA"NEATLIST"
65512 DATA0,3,6,11,14,17,20,26,30,34,39,42,46,49,53,56,58,65,70,76,79,83,87,91,9
6,102,108,114,120,124,128,133,139,142,144,148,153,156,159,164,168,173,177,181,18
5,189,193,199,205,208,212,217,221,225,230,236,240,245,250,255,258,262,264,266,27
1
65513 DATA277,280,283,286,293,298,303,308,311,317,321,324,328,329,330,331,332,33
3,336,338,339,340,341,344,347,350,353,356,359,362,365,368,371,374,377,380,383,38
7,390,393,396,399,402,405,409,413,417,421,425,429,432,435,439,442,445,449,454,46
0
65514 DATA464,466,468
65520 LPRINTSTRING$(S,138):LPRINTTAB(LM)USING"&&&&&";LN!;:RETURN
65524 R=0:IFLEFT$(A$,1)=" "THENT=T1+T2+LMELSET=T1+1+T2+LM
65525 IFLEN(A$)>RM-TTHENB$=LEFT$(A$,RM-T):A$=RIGHT$(A$,LEN(A$)-RM+T):R=1:T2=5ELS
EB$=A$
65526 LPRINTTAB(T)B$:IFR=1THEN65524ELSEA$="":T2=0:RETURN
```

Program Listing 2.

572
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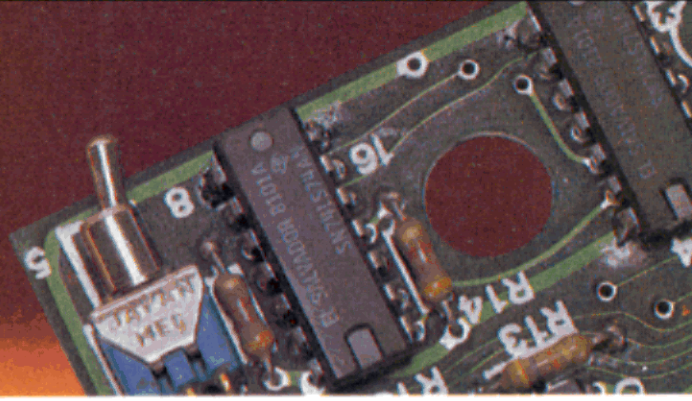
THE SWITCH



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A machine-language routine for fast Basic data transfer.

Array I/O

Norman Neff
Dep't. of Mathematical Sciences
Trenton State College
Trenton, NJ 08625

Efficient input and output of data files unfortunately is not one of the capabilities of the Level II Basic cassette system. The following is a short machine language routine that allows improved transfer of Basic data files.

To write a 1000 element single-precision array to tape, it might seem reasonable to code: FOR I = 1 to 1000: PRINT # – 1,A(I): NEXT. This very straightforward code will work— if we can find a cassette with 67 minutes of tape on each side! Each of the 1000 executions of the PRINT #-1 statement writes a 256-byte leader, followed by the few bytes required for an ASCII representation of the value A(I). At 500 baud, the array write-loop requires 4000 seconds. The transmitted array occupies 4000 bytes of RAM, so the transfer rate of useful information is one byte per second, or only eight baud.

The effective transfer rate within Basic can be improved by transmitting more data in each Print #-1 statement. However, the coding becomes very awkward as efficiency increases, Basic allows no more than 248 data bytes per PRINT #-1, so it always spends over half the I/O time working with leaders.

My machine language I/O routine writes one leader and then dumps or loads the entire RAM area occupied by any nonstring array at 500 bauds. It is easy to use and occupies only 153 bytes of protected memory.

Using the I/O Routine

With a monitor or assembler, create a System I/O tape containing the machine language in Program Listing 1. Before keying or loading the Basic program, protect memory at 32600, load the I/O tape, and press the Break key.

A Basic program calls the I/O routine through the USR function (see Program Listing 2). Each call of the USR function inputs or outputs one nonstring array. The entry address POKEd into 16526, 16527 is 106,127 for output. The entry for input is 155,127. The argument of USR is: VARPTR (first element of ar-

The Key Box

Basic II
Level II
Cassette System

```
                00100 ;IO
                00110 ;USR SUBROUTINE
                00120 ;FAST ARRAY I/O
7F58            00130           ORG     32600
7F58 2B         00140 INIT      DEC     HL      ;SUBR TO INIT LOOPS
7F59 E5         00150           PUSH    HL      ;IX=HL=PTR TO #DIMS
7F5A DDE1       00160           POP     IX
7F5C DD56FF     00170           LD      D,(IX+0FFH)     ;DE=LENGTH
7F5F DD5EFE     00180           LD      E,(IX+0FEH)
7F62 0600       00190           LD      B,0H    ;START CHECKSUM
7F64 3E00       00200           LD      A,0H    ;DEFINE DRIVE
7F66 CD1202     00210           CALL    212H
7F69 C9         00220           RET
7F6A CD7F0A     00230 STARTO    CALL    0A7FH   ;ENTRY FOR OUTPUT
7F6D CD587F     00240           CALL    INIT    ;LAST 2 BYTES ABS
7F70 CD8702     00250           CALL    0287H   ;WRITE LEADER
7F73 DD7EFB     00260           LD      A,(IX+0FBH)     ;WRITE TYPE
7F76 CD6402     00270           CALL    264H
7F79 7B         00280           LD      A,E     ;WRITE LENGTH
7F7A CD6402     00290           CALL    264H
7F7D 7A         00300           LD      A,D
7F7E CD6402     00310           CALL    264H
7F81 7E         00320 BYLPO     LD      A,(HL)  ;WRITE DATA
7F82 CD6402     00330           CALL    264H
7F85 80         00340           ADD     A,B     ;UPDATE CHECKSUM
7F86 47         00350           LD      B,A
7F87 23         00360           INC     HL
7F88 1B         00370           DEC     DE      ;DECR, TEST COUNTER
7F89 7A         00380           LD      A,D
7F8A B3         00390           OR      E
7F8B FE00       00400           CP      0H
7F8D 20F2       00410           JR      NZ,BYLPO
7F8F 78         00420           LD      A,B     ;WRITE CHECKSUM
7F90 CD6402     00430           CALL    264H
7F93 06FF       00440           LD      B,0FFH  ;DELAY
7F95 10FE       00450 DELAY     DJNZ    DELAY
7F97 AF         00460           XOR     A       ;CASSETTE OFF
7F98 D3FF       00470           OUT     (0FFH),A
7F9A C9         00480           RET
7F9B CD7F0A     00490 STARTI    CALL    0A7FH   ;ENTRY FOR INPUT
7F9E CD587F     00500           CALL    INIT    ;LAST 2 BYTES ABS
7FA1 CD9602     00510           CALL    0296H   ;READ LEADER
7FA4 CD3502     00520           CALL    0235H   ;READ, TEST TYPE
7FA7 DDBEFB     00530           CP      (IX+0FBH)
7FAA 2037       00540           JR      NZ,TYPE
7FAC CD3502     00550           CALL    0235H   ;TEST  LENGTH
7FAF BB         00560           CP      E
7FB0 2027       00570           JR      NZ,LENG
7FB2 CD3502     00580           CALL    0235H
7FB5 BA         00590           CP      D
7FB6 2021       00600           JR      NZ,LENG
7FB8 CD3502     00610 BYLPI     CALL    0235H   ;READ DATA
7FBB 77         00620           LD      (HL),A
7FBC 80         00630           ADD     A,B     ;UPDATE CHECKSUM
7FBD 47         00640           LD      B,A
7FBE 23         00650           INC     HL
7FBF 1B         00660           DEC     DE      ;DECR, TEST COUNTER
7FC0 7A         00670           LD      A,D
7FC1 B3         00680           OR      E
7FC2 FE00       00690           CP      0H
7FC4 20F2       00700           JR      NZ,BYLPI
7FC6 CD3502     00710           CALL    0235H   ;TEST CHECKSUM
7FC9 90         00720           SUB     B
7FCA 210000     00730           LD      HL,0    ;ERROR CODE 0
7FCD 281C       00740           JR      Z,EXIT
7FCF 3E43       00750 BAD       LD      A,'C'   ;DISPLAY C
7FD1 323F3C     00760           LD      (3C3FH),A
7FD4 210300     00770           LD      HL,3
7FD7 1812       00780           JR      EXIT
7FD9 3E4C       00790 LENG      LD      A,'L'   ;DISPLAY L
7FDB 323F3C     00800           LD      (3C3FH),A
7FDE 210200     00810           LD      HL,2
7FE1 1808       00820           JR      EXIT
7FE3 3E54       00830 TYPE      LD      A,'T'   ;DISPLAY T
7FE5 323F3C     00840           LD      (3C3FH),A
7FE8 210100     00850           LD      HL,1
7FEB AF         00860 EXIT      XOR     A       ;CASSETTE OFF
7FEC D3FF       00870           OUT     (0FFH),A
7FEE C39A0A     00880           JP      0A9AH   ;RETURN ERROR CODE
0000            00890           END
```

Program Listing 1

ray)-2*(number of dimensions). For example, a three dimensional array B is transmitted by Y = USR(VARPTR(B(0,0,0))-6).

Error Checking

There is no error checking on output. On input, the USR function returns a value of zero if no error is detected. The kinds of input errors possible are:

• Type Error: Type of file on tape doesn't match type of array in RAM. A bad argument in the USR function also produces a type error. When the type error occurs, a "T" appears on the video, no data is read into the array, and an error code of one is returned as the value of the USR function.

• Length Error: Type matches, but the length of the data file differs from that of the array. Check the dimensioning of the array. "L" is displayed, no data is transferred, and the return code is two.

• Checksum Error: Probable hardware error. Try repeating the read with backup tape. "C" is displayed, data is transferred, the return code is three.

Caution

We can cause the example in Program Listing 2 to fail by inserting the apparently innocuous line 82 W=7. When the Basic interpreter reaches this line, the new variable W is added to the symbol table. To make space for W, all arrays are displaced upward a few bytes in RAM. The value of X in line 85 is now incorrect because it was computed before the array A was displaced. To remedy this, proceed as in line 63, or else insert the statement W=W anywhere before the first call of the VARPTR function.

Relocation

The machine language routine contains two internal absolute address references that need to be adjusted if the routine is loaded to a location other than 32600 (see the CALL INIT instructions in Listing 1). As an example of relocation, suppose we wish to place the routine in RAM location 30000. We must decrease by 2600 decimal (A28 hex) the entry points from Basic and the two absolute address references in the I/O routine. The original output entry location POKEd into 16526, 16527 was 106 (LSB), 127 (MSB), or, in decimal, 106 + (127)(256) = 32618. The relocated output entry is 32618-2600 = 30018 decimal. Dividing 30018 by 256 gives 117 (MSB) with remainder 66 (LSB), so the new output entry point to be POKEd into 16526, 16527 is 66,117. A similar calculation shows that the new input entry point is 115,117.

If you are using an assembler, the two absolute references within the I/O routine will be automatically adjusted if you reassemble the text to originate at 30000. With a monitor we manually correct the last two bytes of the two CALL INIT instructions in Listing 1. The original bytes 58,7F represent 7F58 hex. Subtract A28 hex to get the new address 7530 hex. The replacement bytes are 30,75 (hex). After replacing the two appearances of 58,7F by 30,75, the routine may be moved to location 32000.

Modifications

At the cost of more memory, several modifications may be made. First, to get an understanding of the unmodified routine study Listing 1 along with the material on the VARPTR function in the Level II Basic manual. The only details that may not be obvious are the indexed references, such as in line 260 of Listing 1. (IX + 0FBH) is the address computed by adding FB hex, which is the signed integer-5, to the contents of the IX register. The IX register contains one less than the argument passed to the routine. That argument is the address of the beginning of the depth information for the array, so the IX register points to the number of dimensions for the array. By adding -5 to the dimension address, we backspace past two bytes of length information and two bytes for the name, to point to the location of the type information.

Some possible modifications follow. Using an assembler is recommended, except for the first modification.

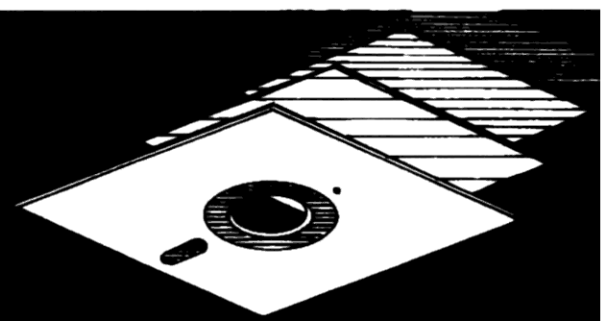
• Add an entry for verification, similar to the Basic CLOAD? command.

• Add string array capability. The array space representation of a string array does not contain any of the string data. The data element in array space is a three-byte pointer, giving the length and starting location of a string, usually in string space. Our output coding should write the type and array length information and then give the individual length followed by the actual data from string space for each string in the array. Input coding should run through the array, checking the individual string length and then reading the string from tape into RAM starting at the location given in array space. For this to work, the calling program must first set up a dummy array with strings of proper length.

• Extend Basic by creating new keywords to access the I/O routine. To do this you must discover, scrounge, or buy "secret" information on the workings of the interpreter. ■

```
5 REM EXAMPLE OF USE OF TAPE IO USER ROUTINE
10 DEFINT A,B
20 DIM A(20),B(20)
30 FOR I=0 TO 20:B(I)=99:A(I)=I:NEXT
53 PRINT I,B(8),Z
55 PRINT "PREPARE TO RECORD DATA":STOP
61 POKE 16526,100:POKE16527,127: 'OUTPUT ENTRY
63 PRINT#-1,444:Y=USR(VARPTR(A(0))-2):PRINT#-1,555
67 PRINT "PREPARE TO PLAY DATA":STOP
75 POKE 16526,155 'INPUT ENTRY
80 X=VARPTR(B(0))-2  'ARGUMENT IS ARRAY B
85 INPUT#-1,I:Y=USR(X):INPUT#-1,Z
90 PRINT I,B(8),Z,"CODE=",Y
```

Program Listing 2



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The error-checking done during program transfers on the TRS-80 ranges from none at all to very good. The worst case is a CSAVE under Basic where not a single checksum follows the program data out to tape. Later, when that program is read back in, there is no way of guaranteeing that it is good.

The format of a machine language tape is much better. The data is written in blocks; each block is followed by a one-byte checksum. This checksum is generated by adding together, without carries, all of the bytes of data (256 plus some overhead) in that block. When the program is later read back in, each incoming block of data is checksummed in the same fashion, and that checksum is compared to the one stored on the tape. If the two checksums are different, there has been an error. If the two checksums are the same there has not been an error unless multiple errors caused the checksums to come out the same.

Better still is the way data is stored on disk. As with a machine language tape, data is transferred and stored in blocks of 256 bytes, one sector on a disk. Each sector of data is followed by two CRC bytes. These two bytes provide the error-checking.

CRC (Cyclic Redundancy Code) represents a process of taking a block of data bytes and performing a very fancy and involved checksum. A CRC check can be used in any data transmission. Just as with a checksum the two CRC bytes are stored (or transmitted) with the block of data. Upon retrieval (or reception) they are compared with two CRC bytes newly calculated from the data. A bad comparison means an error in transmission.

Although CRC checks are often used for error correction, in our disk system they are relied upon for error detection. Consider the transmission of the two hex bytes of data 7F A2. If a one-byte checksum were used, it would be 21, the sum of these bytes without carry. Obviously, there are many pairs of data bytes that give this checksum. If a two-byte checksum were used, in this case 01 21, there are nearly 200 pairs of data bytes that would checksum the same. However, if these two data bytes were followed by two CRC bytes, in this case 90 C0, it would be impossible to overlook an error in transmission. No two data bytes other than 7F A2 will generate the same two CRC bytes.

A two-byte example proves nothing in general, but for any block of data, a CRC will provide a much more unique signature than a simple checksum. Multiple errors are much more likely to be detected. But CRC checks bring added difficulty in

Program 1. Basic Program for CRC Calculation

```
50 REM            **   CRC GENERATOR   **
60 REM
70 REM   THIS  PROGRAM WILL  SIMULATE  THE  CRC  GENERATING
ALGORITHM
80 REM  USED BY THE TRS-80 FLOPPY DISK CONTROLLER.
90 REM   THERE ARE TWO CRC BYTES, WHICH ARE ALWAYS INIT-
100 REM  IALIZED  TO FFFF (HEX).  THIS VALUE CHANGES AS EACH
DATA
110 REM  BYTE IS  ACCOUNTED FOR.  IN  THIS PROGRAM,  THE TWO
CRC
120 REM  BYTES ARE  KEPT IN C(15) MSB THROUGH C(0) LSB.  THE
DATA
130 REM   BYTE INPUT IS  KEPT  IN D(7)-D(0).   ANY NUMBER OF
DATA
140 REM  BYTES CAN BE ENTERED IN SEQUENCE, AT THE PROMPT.
150 REM
160 REM  ROXTON BAKER, 56 SOUTH RD., ELLINGTON, CT. 06029
170 REM
180 CLS: PRINT@150,"CRC GENERATOR" :PRINT :PRINT
190 DEFINTI,J,K,L,C,A,D
200 DIM A(8),C(16),D(8)
210 C1=255 : AI=C1 : GOSUB 890
220 FOR K=0 TO 7
230 C(K+8)=A(K)
240 NEXT K
250 C2=255 : AI=C2 : GOSUB 890
260 FOR K=0 TO 7
270 C(K)=A(K)
280 NEXT K
290 MS=0 : AI=0 : INPUT"ENTER DATA BYTE IN HEX  ";H$
300 REM  CONVERT HEX BYTE INTO DECIMAL DIGIT
310 FOR K=1 TO 0 STEP -1
320 L=ASC(MID$(H$,2-K,1))
330 IF (L>=65) AND (L<=70) THEN M=L-55 : GOTO 370
340 IF (L>=48) AND (L<=57) THEN M=L-48 : GOTO 370
```

Program continues

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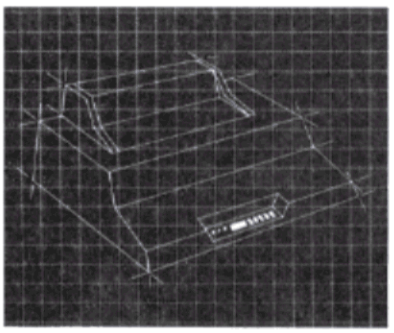

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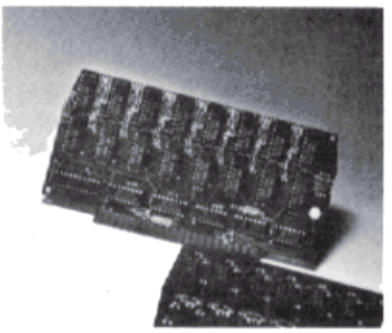

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generating the check bytes.

In the TRS-80, CRC checks are used primarily in the transfer of disk data. All data transfers to and from the disk are handled by an integrated circuit floppy disk controller, or FDC. The particular FDC used is a Western Digital FD1771. When reading or writing a sector of data, this FDC will automatically generate, in hardware, the two CRC bytes for that data. Only in hardware could the CRC bytes be generated fast enough to accommodate the speed of disk data transfer.

Each way of generating CRC bytes from data signatures the data differently and results in different CRC bytes. The 1771 FDC uses the IBM SDLC standard. There are always two CRC bytes and they always start off, before any data is handled, with an initial value of FF FF hex. The standard also defines the exact algorithm used in calculating the new value of the CRC bytes from their current values and the value of the incoming data byte.

Fortunately, it is not necessary to understand CRCs to use them. What's wanted, should you be inclined to decipher the disk CRCs or use CRCs in a tape routine or data transmission scheme, is a reliable method of producing them. Hand-calculating a CRC from just one byte of data is tedious, error-prone, and too slow even for TRS-80 tape.

Program 1 is a Basic program suitable for hand-entry of data bytes in hex. Each new pair of CRC bytes generated is displayed. Note that "<>" is used for the exclusive-or operation. This program is convenient when the CRC of only a few bytes of data is to be generated. A useful improvement is to allow for the entry of ASCII data also.

The Basic program could be modified to CRC blocks of data, but at some point it will be necessary to use assembly programming. Certainly this will be required if these CRC bytes are being used in a system. The calling portion of Program 2 is just a simple loop which calls NEWCRC as required to generate the new CRC bytes for each byte of stored or incoming data. The actual calculation of the CRC bytes in NEWCRC takes about 93 microseconds for each byte of data.

Compared to a simple checksum this is very slow, but if the time is available a CRC should be used. The data received or retrieved will be good if the CRC bytes check out. And the software overhead is not too large to incorporate if you are setting up a system from scratch.

The DOS already contains a routine to CRC a block of data. This routine checks DOS passwords. Whenever a disk file is accessed, the eight-character password given by the user is stored at 5155-515C hex. A routine at 50D1-50FC takes these bytes in reverse order and manipulates the bits of each one, resulting in a two-byte signature which is returned in HL. The method used by this routine is not exactly the SDLC standard, but it is a CRC algorithm. Therefore, it could be used to error-check a block of data. Set DE to the address of the last byte in the block and set B to the number of bytes in the block. Set HL to some fixed value, say FFFF. Call 50DD as a subroutine. On return, the two CRC bytes will be in HL.

The disadvantages to using this resident DOS routine are that it handles blocks of data rather than single bytes, and it is slow. Compared to the program of Program Listing 2, the DOS routine will take about twice as long to CRC a block of code. Also, it will be difficult to use this routine for blocks of more than 256 bytes because it uses only the B register as a counter. But there are applications that can use this free code advantageously. ■

Program continued

```
350 PRINT"INVALID HEX BYTE  --  TRY AGAIN"
360 MS=-1 : K=0 : GOTO 380
370 AI=AI+INT(16[K+.25)*M    'Note  up-arrow  may  print  as
bracket
380 NEXT K
390 IF MS THEN 290
400 GOSUB 890
410 FORK=0 TO 7
420 D(K)=A(K)
430 NEXT K
440 GOSUB 630
450 REM  NOW CONVERT NEW CRC BYTES TO HEX FOR DISPLAY
460 T=19
470 FOR K=0 TO 3
480 T=T-4 : CT=0
490 CT=CT-8*C(T)
500 CT=CT-4*C(T-1)
510 CT=CT-2*C(T-2)
520 CT=CT-C(T-3)
530     IF    CT>=10    THEN     NC$(K)=CHR$(CT+55)     ELSE
NC$(K)=CHR$(CT+48)
540 NEXT K
550 PRINT"NEW CRC BYTES ARE :  ";
560 FOR K=0 TO 3
570 PRINT NC$(K);
580 IF K=1 PRINT" ";
590 NEXT K
600 PRINT : PRINT
610 GOTO 290
620 REM  THIS SUBROUTINE PERFORMS THE CRC ALGORITHM
630 PI=C(15)<>D(7)
640 PJ=C(14)<>D(6)
650 PK=C(13)<>D(5)
660 PL=C(12)<>D(4)
670 PM=C(11)<>D(3)<>PI
680 PN=C(10)<>D(2)<>PJ
690 PO=C(9)<>D(1)<>PK
700 PP=C(8)<>D(0)<>PL
710 C(15)=C(7)<>PM
720 C(14)=C(6)<>PN
730 C(13)=C(5)<>PO
740 C(12)=C(4)<>PI<>PP
750 C(11)=C(3)<>PJ
760 C(10)=C(2)<>PK
770 C(9)=C(1)<>PL
780 C(8)=C(0)<>PM
790 C(7)=PI<>PN
800 C(6)=PJ<>PO
810 C(5)=PK<>PP
820 C(4)=PL
830 C(3)=PM
840 C(2)=PN
850 C(1)=PO
860 C(0)=PP
870 RETURN
890 REM   THIS SUBROUTINE TAKES  AN  INTEGER  AI  FROM 0-255
AND
```

Program continues

Program continued

```
900 REM    CONVERTS  IT INTO -1'S AND 0'S IN PREPARATION FOR
THE
910  REM   USE OF  ITS  BITS IN  LOGICAL OPERATIONS.   THESE
BITS
920 REM   ARE RETURNED AS A(7) MSB - A(0) LSB.
930 A(7)=-SGN(128 AND AI)
940 A(6)=-SGN(64 AND AI)
950 A(5)=-SGN(32 AND AI)
960 A(4)=-SGN(16 AND AI)
970 A(3)=-SGN(8 AND AI)
980 A(2)=-SGN(4 AND AI)
990 A(1)=-SGN(2 AND AI)
1000 A(0)=-SGN(1 AND AI)
1010 RETURN
```

Program 2. Assembler Program to CRC Check a Block of Data

```
-
00010 ;  THIS ROUTINE WILL CALCULATE THE  SDLC CRC  (AS USED
IN
00020 ; THE TRS-80 FLOPPY DISK) FOR ANY BLOCK OF DATA IN
00030 ;  MEMORY BETWEEN 1  AND  65K BYTES LONG.  THE ADDRESS
AT
00040 ;  WHICH  TO  START  IS PASSED TO THIS ROUTINE  IN HL.
THE
00050 ; NUMBER  OF BYTES  TO  CRC CHECK  MUST  BE  STORED IN
NBYTES.
00060  ;  THE  INITIAL VALUE  OF THE CRC  MUST BE STORED  IN
CRCINT.
00070 ; IT SHOULD NORMALLY BE FF FF.  THE NEW CRC
00080 ; VALUE IS KEPT IN DE, AND IS RETURNED TO THE CALLING
00090 ; PROGRAM (ASSUMED TO BE BASIC), IN HL.
00100 ;
00110 ; BY ROXTON BAKER, 56 SOUTH RD., ELLINGTON, CT. 06029
00120 ;
00130  NBYTES      EQU        07FF4H        ;0  BYTES TO CRC
HERE
00140                                    ;  IN 7FF4, 7FF5.
00150  CRCINT       EQU       07FF6H       ;NORMALLY  FF  FF
HERE.
00160 GETARG      EQU        0A7FH        ;GET USR ARG IN HL
00170             ORG        07D50H       ;PUT IT ANYWHERE.
00180             CALL       GETARG       ;GET START  ADDRESS
IN HL
00190             LD         BC,(NBYTES)  ;1 GIVES  1 BYTE, 0
GIVES
00200                                    ;  65K BYTES
00210             LD         DE,(CRCINT)  ;STARTING VALUE  OF
CRC
00220 CRC1        PUSH       BC           ;SAVE COUNTER
00230              CALL       NEWCRC       ;COMPUTE NEW CRC
BYTES.
00240             POP        BC           ;RESTORE COUNTER.
00250              INC        HL           ;POINT  TO  NEXT
DATA BYTE
```

Program continues

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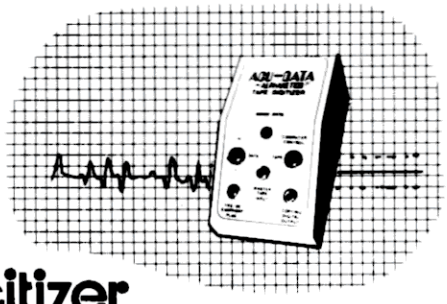

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Program continued

```
00260              DEC        BC             ;CHECK  IF   ALL
DONE.
00270              LD         A,B
00280              OR         C
00290               JR          NZ,CRC1        ;IF   NOT,   DO
ANOTHER.
00300              EX         DE,HL          ;PUT NEW CRC IN HL
00310               JP         0A9AH          ;   FOR  RETURN TO
BASIC.
00320 ;
00330 ;  THIS SUBROUTINE WILL FACTOR ONE BYTE INTO THE IBM
00340 ;  SDLC  CRC CALCULATION, GIVEN THE STARTING CRC IN DE
AND
00350 ; THE ADDRESS  OF THE BYTE TO BE ACCOUNTED FOR POINTED
TO
00360  ; BY  HL.   THE  NEW  CRC IS  RETURNED  IN DE.   THIS
ROUTINE
00370  ; IS THE Z80  VERSION  OF  ONE DUE TO  VASA, COMPUTER
DESIGN
00380 ; MAY 1976, PG. 190, AS MODIFIED BY SOCHA, COMPUTER
00390 ; DESIGN MAY 1979, PG. 6.
00400 ;
00410  NEWCRC       LD          A,(HL)         ;GET NEXT  DATA
BYTE
00420              XOR        D
00430              LD         D,A
00440              SRL        A
00450              SRL        A
00460              SRL        A
00470              SRL        A
00480              XOR        D              ;GENERATE IJKLMNOP
00490               LD          D,E            ;SWAP   TWO  CR
BYTES
00500              LD         E,A            ;  PER SOCHA
00510              RL         A
00520              RL         A
00530              RL         A
00540              RL         A
00550              LD         C,A            ;SAVE MNOPXIJK
00560              RL         A
00570              RL         A
00580              AND        1FH            ;SELECT 000IJKLM
00590              XOR        D
00600              LD         D,A
00610              LD         A,C
00620              AND        0F0H           ;SELECT MNOP0000
00630              XOR        D
00640              LD         D,A            ;CRCH DONE IN D
00650              LD         A,C
00660              RL         A
00670              AND        0E0H           ;SELECT NOP00000
00680              XOR        E
00690              LD         E,A            ;CRCL DONE IN E
00700              RET
00710;
00720               END        402DH          ;TO   DOS   AF'
LOADING.
```

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84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
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90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
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93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
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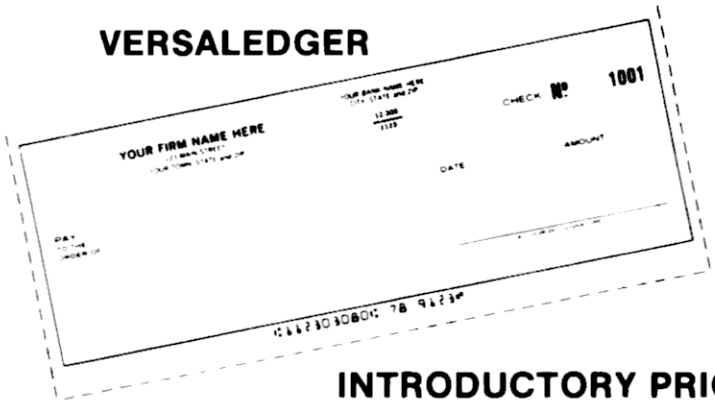
VERSALEDGER



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$295 (Model II TRSDOS Version)
$495 (Model II Peachtree CP/M Version)

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GENERAL LEDGER

Processes

- ★ Flexible design allows system to be easily adapted to both small businesses and also to firms performing client writeup services
- ★ Add, change or delete records within the Chart of Accounts (Master) File
- ★ List the Chart of Accounts File
- ★ Key in transactions into the Transactions (Journal Entries) File
- ★ List the Transactions File
- ★ If other Peachtree Software packages are present, pass summary transactions from these packages to the General Ledger at the end of the accounting period
- ★ At the end of an accounting period, print out the major reports
  - (1) Trial Balance (Detail Report)
  - (2) Transaction Registers
  - (3) Balance Sheet
  - (4) Prior Year Comparative Balance Sheet
  - (5) Income Statement
  - (6) Prior Year Comparative Income Statement
  - (7) Department Income Statements

File Information

There are two main computer files maintained within the General Ledger System

(1) The of Accounts File
- Account Number
- Description
- Account Type
- Balance Sheet Column Code
- Current Amount
- Year-To-Date Amount
- Budget Amount
- Prior Year Monthly Amounts

(2) The Transactions File
- Account Number
- Description
- Source Code
- Reference
- Date
- Amount

ACCOUNTS RECEIVABLE

Processes

- ★ Add, change or delete records within the Customer File
- ★ List the entire Customer File, or any Customer within the File
- ★ Enter invoices, payments, credits and adjustments
- ★ Prepare invoices and statements
- ★ Produce the following reports
  - (1) Aged Accounts Receivable
  - (2) Invoice Register
  - (3) Payment, Credit and Adjustment Register
  - (4) Customer Account Status Report
- ★ At the end of a month, post the following items to the General Ledger:
  - (1) Invoiced Sales
  - (2) Freight Charges
  - (3) Sales Tax
  - (4) Service Charge Income
  - (5) Cash Payments
  - (6) Discounts Allowed
  - (7) Returns/Credits
  - (8) Income Adjustments
  - (9) Accounts Receivable

File Information

There are three main computer files maintained within the Accounts Receivable System, the Customer File, the Invoice File, and the Transaction File.

CUSTOMER FILE
- Customer Account Number
- Customer Name
- Address
- Phone
- Type of Account
- Credit Terms
- Credit Limit
- Tax Rate
- Discount Rate
- Date of Last Credit
- Date of Last Debit
- Amount of Last Credit
- Amount of Last Debit
- Current Balance
- High Balance
- Year-To-Date Sales
- Year-To-Date Payments
- Automatic Billing Amount

INVOICE FILE
- Invoice Number
- Invoice Date
- Invoice Amount
- Credit Terms

TRANSACTION FILE
- Transaction Type
- Transaction Date
- Transaction Amount

→9

ACCOUNTS PAYABLE

Processes

- ★ Add, change or delete records within the Vendor File
- ★ List the Vendor File
- ★ Enter vouchers
- ★ Automatically determine which vouchers to pay
- ★ Print checks and a Check Register
- ★ Produce the following reports:
  - (1) Open Voucher Report
  - (2) Accounts Payable Ageing Report.
  - (3) Cash Requirements
- ★ At the end of a month, prepare the General Ledger Transfer File, passing the following information for each debit or credit transaction:
  - (1) Account Number
  - (2) Description
  - (3) Source Code
  - (4) Date
  - (5) Amount

File Information

There are two main computer files maintained within the Accounts Payable System, the Vendor File and the Voucher File.

VENDOR FILE
- Vendor Code
- Vendor Name
- Address
- Phone
- Year-To-Date Purchases
- Year-To-Date Payments
- Current Balance
- Last Payment
- Date of Last Payment
- Monthly Entry Flag
- Due Date of Month
- Debit Account Number
- Amount (Debit)
- Month Last Paid

This file may also contain information to enable generation of automatic vouchers for those items such as rent or bank payments that are paid every month.

VOUCHER FILE
- Voucher Code
- Voucher Date
- Amount Due
- Date Due
- Discount Percent
- Discount Amount
- Discount Date
- Invoice Number
- Invoice Date
- Status

Plus up to six account number-amount fields for General Ledger account numbers to which the amount due is to be distributed.

PAYROLL

Processes

- ★ Add, change or delete records within the Employee File
- ★ List the Employee File
- ★ Modify the Tax Information Files
- ★ At the end of a pay period -
  - (1) Calculate Pay
  - (2) Print Checks
  - (3) Print Payroll Register
- ★ At the end of a month -
  - (1) Print the monthly summary
  - (2) Print the Unemployment Tax Report
  - (3) Prepare the General Ledger Transfer File, passing the following information:
    - Net Pay (Cash)
    - Employee FICA Withheld
    - Federal Tax Withheld
    - Insurance Deductions
    - Miscellaneous Deductions
    - State Tax Withheld
    - Local Tax Withheld

  The gross pay for up to twenty payroll departments may also be passed to the General Ledger.
- ★ At the end of a quarter, print the 941A report information.
- ★ At the end of a year, print the W-2 forms.

File Information

There are two main computer files maintained within the Payroll System, the Employee Master File and the Tax File.

EMPLOYEE MASTER FILE
- Name
- Address
- Local Code
- State Code
- Marital Status
- Exemptions, Federal
- Exemptions, State
- Social Security Number
- Pay Period
- Pay Type
- Pay Rate
- Insurance Deduction
- Miscellaneous Deduction
- Date Employed
- Date Terminated
- Last Check Information

Payroll (con't)

And current, month-to-date, quarter-to-date and year-to-date totals for:
- Regular Earnings
- Overtime Hours/Earnings
- Other Hours Rate/Earnings
- Commission Earnings
- Miscellaneous Income
- FICA Deductions
- Federal Deductions
- State Deductions
- Local Deductions
- Insurance Deductions
- Miscellaneous Deductions

TAX FILE
- (for single and married persons)
- Federal Tax Information Tables
- State Tax Information Tables
- Local Withholding Tax Information Tables

An Overview of the Inventory System

Inventory is probably the most speculative of all of a company's assets. A true measure of the effectiveness of management is the ability with which it supervises the inventory control function.

The Peachtree Software™ Inventory Management System is designed to (1) give you better merchandise control, (2) allow you to lower your dollar investment in inventory, and (3) improve customer service and response.

The System maintains detailed information on each inventory item including the part number, description, unit of measure, vendor and reorder data, item activity, and complete information on current item costs, pricing, and sales. Transactions effecting inventory (sales, receipts, adjustments) may be applied at any time to insure the inventory data is always up to date and accurate.

As with all Peachtree products, the system is interactive, simple to operate, and provides reports that are up to date and comprehensive.

Particular features of the Peachtree Software™ Inventory Management System include:

- Interactive, menu-driven programs
- Self-instructing user documentation
- Long item number - up to 15 characters
- Departmentalizing of items
- Multiple pricing levels
- Processes items on reserve (committed but still in stock)
- Online item query at any time
- Comprehensive management reporting
- Automatic month end file backup
- Recovery routines for hardware failures
- Sample data for demonstration and training

How the System is Designed

The Inventory Management System operates with an **Inventory Master File** which allows for the creation of each inventory item and for the recording of transactions (sales, receipts, returns, reserves, and adjustments) to each inventory item.

The Inventory Master File contains the item number, description and various other data on item costs, prices, reorder levels, vendor refereence, and activity. The items within the Master File are entered, changed, deleted, and queried through the **Inventory Master File Maintenance** program. All data on all items may be listed by using the **Detail Inventory Report** program.

Transactions may be applied at any time to the Master File through the **Enter Inventory Transactions** program. An **Update Report** automatically prints during this entry process to provide an audit trail of all inventory acitivity.

Several reports are available for the maintaining of stock, analysis, and forecasting. These reports include the **Physical Inventory Worksheet, Inventory Price List, Departmental Summary Report, Inventory Status Report,** the **Reorder Report** and the **Period-to-Date** and **Year-to-Date** reports.

At the end of an accounting period (usually a month), and then again at the end of a year, the **End of Period Processing** program is run to update current balances and clear previous balances.

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Tests Every Component Of Your TRS-80 and Verifies Proper Operations

For Cassette or Disk

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ARE YOU SURE?

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ROM:	checksum test
RAM:	four separate tests including every address and data value.
VIDEO DISPLAY:	character generator, video RAM, and video signal.
KEYBOARD:	every key contact tested.
LINE PRINTER:	character test.
CASSETTE RECORDER:	read/write/verify data.
RS-232-C INTERFACE:	connector fault, data transmission, framing, data loop, baud rate generator.
DISK DRIVES:	disk controller, drive select and restore, track seek and verify data, read/write/verify all tracks and sectors with or without erasing, sector formatting, disk drive timer, disk head cleaner.

— Individual tests of each device with operator monitoring and intervention.
— Continuous sysem tests run continually for hours testing each component, with diagnostic reports optionally written on line printer.
— One program adapts to any system configuration and hardware.
— Complete instructions and documentation.

MON-3 and MON-4

The TRS-80 Monitor Programs #3 and #4 are powerful utility programs enabling you to interact directly with the TRS-80 in Machine Language. They are as useful for beginners as for advanced programmers.

- BEGINNERS can learn to interact directly with the computer in Machine Language.
- 40-PAGE MANUAL provided with each program.
- SIMPLE commands, easy to use.

The Features Of The Monitor Programs Enable You To The Following.....

- DISPLAY memory in different ways.
- DISASSEMBLE memory to see Machine Language commands.
- MOVE and COMPARE memory areas.
- SEARCH through memory to find specific values.
- MODIFY memory in various ways.
- RELOCATE object programs.
- PRINT output on video display or line printer.
- READ and WRITE object tapes in SYSTEM Format.
- UNLOAD programs using low RAM on disk.
- SAVE and READ disk files (MON-4 Only).
- INPUT and OUTPUT of disk sectors (MON-4 Only).
- SEND and RECEIVE data over RS-232-C Interface (MON-4 Only).
- Create SYMBOLIC Tapes (MON-3) or Files (MON-4) of Disassembled output for Editor/Assembler program.

MON-3 (For Cassette Systems) $39.95
MON-4 (For Disk Systems) $49.95

SMART TERMINAL

Enables your TRS-80 to be used as a remote terminal to a time sharing computer system. Supports upper/lower case and full range of control keys, including control key mapping into any ASCII character. Automatic transmission of files between TRS-80 and host computer. Files can be read from or written to cassette tape or disk. Incoming data can be printed on line printer or stored in memory for subsequent save to cassette or disk. Disk and tape files are fully compatible with the ELECTRIC PENCIL program. Baud rate and RS-232-C sense switches can be reset without opening Expansion Interface. Requires RS-232-C interface and modem.

Cassette or Disk Version $69.95

FASTSORT

A series of machine-language subroutines (for 16K, 32K and 48K Systems) to sort data from BASIC programs. Data may be alphabetic (string) or numeric (integer only). Works equally well with Level II or Disk Basic. Complete instructions and examples provided for interfacing with your BASIC programs.

Cassette or Disk Version $9.95

MAILING LIST

Maintains mailing lists of over 1000 names. Commands allow adding, changing, deleting, and finding names. Sorting is done by machine language according to the information in any field (i.e., name, address, zip code). Labels printed in 1, 2, or 3 columns, in master list on one line, or on video display.

Disk Version Only $69.95

HOME BUDGET

Combines the maintenance of your checkbook with analysis of your income, expenses, and monthly bills. Handles data including bills, including bills, income, deposits, checks and debits to your checking account, and cash expenses. Computes checkbook balance, list of unpaid bills, monthly and year-to-date summaries of income and expenses showing income tax deductions. All output printed on video display or line printer at user's option. Complete instructions for customizing to suit your own budget.

Disk Version Only $49.95

SMALL BUSINESS ACCOUNTING

Based on Dome Bookkeeping Record #612, this program keeps track of income, expenditures, and payroll for a small business of up to 16 employees. Income and expenditures can be entered on a daily, weekly, or monthly basis, and the program computes monthly, through last month, and year-to-date summaries. Payroll section keeps record of individual employees and their paychecks with up to six categories of payroll deductions. Employee payroll record and year-to-date payroll totals can be computed. Manual contains complete instructions for customizing to suit your business.

Disk Version $49.95
Cassette Version $29.95
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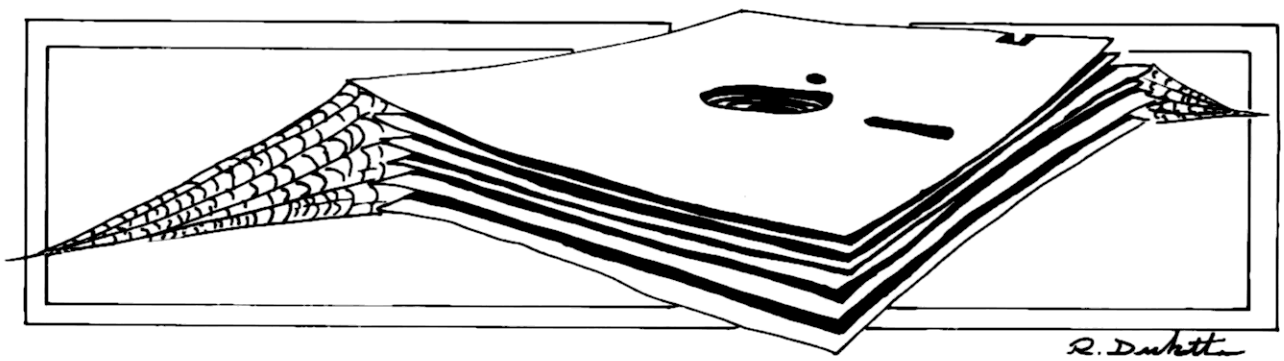
Here's a Model I patch that lets you use glitched disks.

Does FORMAT Get Your BACKUP?



W. D. Hart
1 Allen Road
Norwalk, CT 06851

If you have a Model I system, five thumbs on each hand and a main supply subject to enormous transient effects, you may have accumulated a small pile of unusable or partly-damaged disks. Some crucial file or sector format is distorted so the system will not work any more.

The first time this happened to me, I tried to rewrite the offending disk with the Backup utility. Backup stopped as soon as it reached the damaged portion. The Format utility created a monster of a data disk, which my single-drive system was unable to use at all! Backup now refused to touch the disk because its I.D. did not match, and I did not know how to find the correct I.D. I quickly realized that Backup is only useful with a new disk.

My local Radio Shack store revealed that all would be well if I invested in a disk demagnetizing device, an expensive solution. My pile of useless disks grew, slowly but inexorably.

Another Solution

Using Debug I examined the Backup utility and prepared the following four patches to reformat destination disks. In every case so far, this has returned my damaged disks to further service.

From TRSDOS, call Backup. When the system asks for the source drive number, press Reset to start over. From TRSDOS, call Debug; hit Enter again, to get the core display. Display 5300–53FF. Modify the 'C2' at 534D to read 'C3'. Modify the '28F3' at 53C0 to read '0000'. Modify the '28F2' at 53EB to read '0000'. Modify the 'D2A343' at 53F4 to read '000000'. Go to 5200.

You have returned to Backup, waiting for the source drive number again. The program will now re-format any disk. (If this is unsuccessful repeat the third and last steps only. On a particularly bad evening I had to do this three or four times, but more than once is rare.)

When you mount the destination disk, the program reads it. If it is unused (condition code nonzero) it will be formatted; otherwise the old errors in sector structure stop the backup procedure every time. The first patch transforms the conditional 'Jump nonzero' into a fixed 'Jump' ensuring re-formatting.

Three other messages kept appearing. Because the disk was not blank some other condition codes or flags had been set, now full of the wrong information. The other three patches bypass printing the three messages. This is not a clean solution, but it is simple, and does the job!

Two days after writing this I visited my local Radio Shack computer store again. The staff was backing up some new system disks for the Model III machine, and the new Backup utility gave the option to reformat each disk as it was first loaded! But if you use TRSDOS 2.3 on a Model I system this simple suggestion can keep your old disks running longer.■

The Key Box

Model I
TRSDOS 2.3
Backup

. . . or a Video Genie or a Dick Smith System 80?

What's a TRZ-80?

Eric Lindsay
6 Hillcrest Avenue
Faulconbridge NSW 2776
Australia

TRZ-80 is not a misprint for TRS-80. However, the hardware and software in the two systems are so similar that you could be forgiven for thinking them the same in all but appearance. Also confusing are the number of names under which the same system is sold: TRZ-80 in South Africa; Video Genie in England; PMC-80 in the USA; and as the Dick Smith System 80 in Australia.

I first saw this TRS-80 compatible machine mentioned in the August 1979 issue of *Creative Computing*. The name, this time, was Video Genie EG-3003, and it was made by ECCA International of Hong Kong.

When the same machine was advertised in Australia in late August 1979 as the Dick Smith System 80, I was one of the first people to place my deposit.

The salesman cheerfully took my money and told me how good the machine would be. He hadn't actually seen it, but he had seen a very realistic mock-up. The real thing would arrive in September.

In September it was supposed to arrive in November. In November the arrival date was extended to January. In January it became late March. Finally a day came when I was told that someone had gone to Hong Kong and actually seen the machines on the production line. In April they said they would be able to give me a delivery date real soon. Very early in May I was told that the first shipment had left Hong Kong—all 38 of them.

My local store did not know how many they were getting. The next day they received two machines. I was number two.

Appearance

Resembling the Exidy Sorcerer more than the TRS-80, the System 80 comes in a two-tone plastic case (black base and white top), with white keytops set off by a black surround that also encloses the built-in cassette recorder and tape counter. It looks more impressive than the TRS-80. The sides of the plastic case are made to resemble wood, and look reasonably realistic from a distance.

The keys are standard size, and mostly follow the TRS-80 pattern, except that the Enter key is called new line, the up arrow is ESC, and the down arrow is CTRL. The left arrow is called back space. I do not like the feel of the keys as much as those of the TRS-80, however, key-bounce does not seem to be as much of a problem.

The built-in cassette recorder has a full range of tape control keys, but there is no volume control, nor any user accessible inputs or outputs. Keyboard switch F1 disconnects the recorder from the remote control and allows the user to rewind tapes. The tape counter readings do not coincide with Radio Shack recorders. Luckily, the recorder seems able to cope with tapes recorded at a variety of levels, and the lack of a volume control has not been as much of a problem as I feared. However, it is possible to encounter tapes that will not load through the built-in cassette recorder.

The back panel contains three sockets and three switches. The reset button, the 50-pin expansion socket, the 5-pin tv monitor socket, another 5-pin socket for a second cassette recorder, and a power switch mounted on the built-in (but detachable) power supply are on the left. There is also an additional cord from a built-in modulator which enables you to use a regular home tv as a video display. A switch between the expansion socket and the tv monitor socket enables you to switch from the regular 64 characters per line display to a 32 character double width display more suited to a tv screen. Unfortunately, this width change is not software controllable unless you make a minor change to the System 80 circuitry.

Software Compatibility

The System 80 uses a Microsoft extended Basic, which is almost identical with that used in the TRS-80. All the program pointers are the same, and the memory map is identical. The

only two differences I am aware of are both relatively minor.

When I brought my machine home, I showed it to a friend who teaches computer science. He managed to lock up the system several times after turning the power on. It worked fine when I turned it on, and he was typing his first program line into the machine as soon as he had a Ready prompt. I was following the instructions that came with the machine and using the new line key first. The difference is that a TRS-80 gives you a memory size prompt, whereas the System 80 shows only the Ready prompt. My friend was fairly critical about that; if a machine says it is Ready, he expects it to be ready.

The other difference is in the printer address. In the TRS-80, the printer port is at address 14312. In the System 80, it is at port FD. Unless you make your own printer interface hardware, this will not matter, since you will buy a printer cable suitable for your own machine. It could cause problems in programs that do not use the printer driver routines in Basic, so take considerable care when buying word processor software. Do a test run to ensure they will drive a printer when used in the non-TRS-80 machine. Radio Shack's word processor (Scripsit) is one that does not appear to work in the System 80.

Turn the machine right side up, and remove the entire top. Inside, you have the keyboard printed circuit board, which includes only a few resistors, the power-on LED, and the cassette-on LED. The keyswitches mount individually in a metal mounting plate, and are soldered to the board under that. Interestingly, there are 10 vacant holes at the top of the metal mounting plate. You can arrange access to these by cutting away part of the plastic top cover. I found these very convenient, and have mounted my shift lock, clear, cassette one, and cassette two keys here.

The keyboard can be moved aside by removing eight screws. It is connected to the main board by a very peculiar ribbon cable, which consists of stiff steel wires covered with transparent plastic. There does not appear to be any way to remove it, short of unsoldering it, but you can move the keyboard far enough aside to gain access to everything else.

The main board contains the socketed Z80, three socketed ROM chips, and the eight socketed 4116 RAM chips. There is no provision for any other expansion within the machine. The 7812 and a heatsink mounted 7805 three terminal regulator are also on this board. Considering the amount of heat the 7805 is throwing out, I would have preferred it be mounted elsewhere; however, it has not caused any problems as yet, and the case is well ventilated in that area. Alongside the main board, and connected to it by another of the strange ribbon cables, is the equally large interface board.

The interface board holds the 10.64 MHz crystal, the home tv modulator, relays for the two cassette interfaces, the seven 2102 static memories for the video display, and part of the cassette recorder circuitry. The only chip in a socket is the 2513 character generator. Unlike the TRS-80, this character generator is uppercase only, so converting to upper and lowercase would be far more involved than with the TRS-80. You could make up an adapter and plug in the MCM6670P used in the TRS-80, since it appears to use the same lines, although it is not pin compatible. The main board and the interface board can be removed by undoing three screws on each.

By removing six screws and disconnecting a plug from the interface board it is easy to reach the small board, containing an LM324 quad op amp and a half-dozen components, that drives the cassette recorder. A 50k ohm preset potentiometer sets the tape levels, and this might well be replaced by a more accessible control.

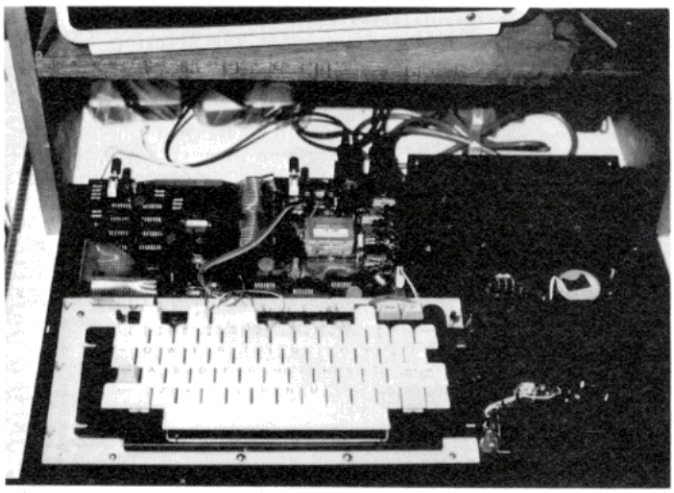
Hardware Compatibility

Most of the problems I have encountered using TRS-80 programs have been because of differences between the hardware of the two machines. Luckily, modifications are simple and cheap, and can be done by anyone handy with a soldering iron.

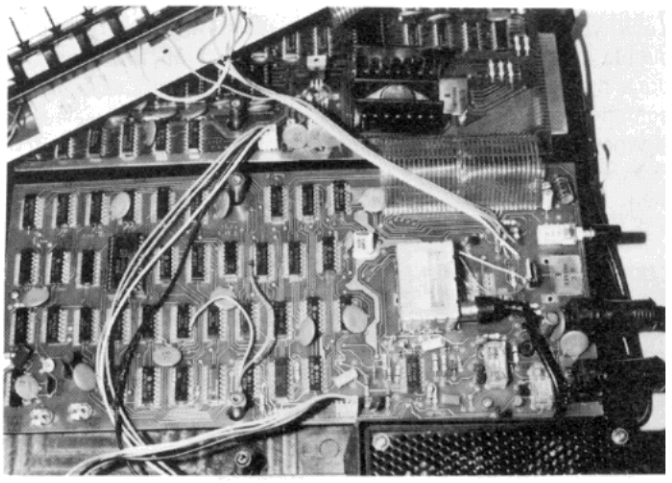
When playing games that use the TRS-80 arrow keys, you soon encounter a problem. There is no right arrow key on the System 80. You can generate a tab by using the shift, CTRL, and I keys simultaneously, but this is useless in game-playing. Adding a switch and running two wires to the proper locations on the back of

Photos by Bob Riep.

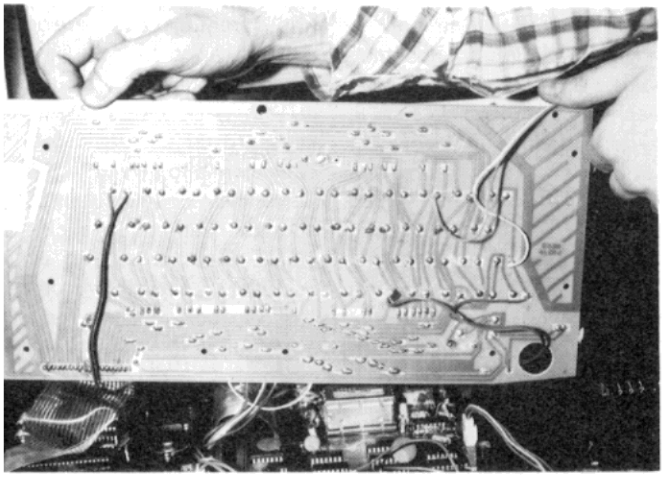
The Dick Smith System 80 with extra keys on the top line.



Into the interior, showing enclosed power supply and cassette recorder on the right, interface board with tv modulator at the center, the CPU board on the left. The Z80 is partly obscured by the ribbon cable from the keyboard.



Full view of the interface board. The large chip is the character generator, which must be replaced to obtain lowercase.



Reverse of the keyboard. The additional wires lead to keytop switches for right arrow, clear and shift lock.

the keyboard printed circuit board solves that. While you have the case open, you may also like to add a Clear key.

The built-in cassette is the other problem. Since there is no volume control, you may encounter tapes that will not load reliably. If they are in Basic there is no problem. Use CLOAD# – 2, and an external cassette recorder. However, you have no such control over System tapes. Dick Smith's technical director, Jim Rowe, suggested adding a change-over switch, and this modification works fine.

I mentioned a back panel switch that converts the video display from 64 characters to 32 double width characters, the same as those produced on a TRS-80 by using the Print CHR$ (23) command. On the System 80, the Print CHR$(23) command simply inserts a space between each normal sized character. An easy hardware modification involving a diode and two lengths of wire, brings that double width 32 character mode under software control.

Into the Interior

Access to the circuitry is relatively easy. Turn the machine upside down, after disconnecting all the leads, and undo eight screws. There are three screws holding the power supply in place, and these should not be touched. I found it best not to remove the screws from the recesses, and instead simply loosen them and put a bit of insulating tape over the top to keep them in correct order.

Improvements over the TRS-80

In my opinion, the improvements over the TRS-80 are very minor. The built-in power supply and cassette make setting up a lot easier. You just plug it into a wall socket and a video monitor. The F1 switch makes the cassette easier to use, but you have no volume control for problem loads, and if you use a light pen, you usually have to change the software to suit the external cassette (which is at FE and not the FF that the TRS-80 and the internal cassette use), or add a change-over switch.

Not having a right arrow key can be a real pain. When I sit down to play some game, I do not want to have to go through the entire program listing looking for places where I have to change CHR$(9) and CHR$(25) to something else.

S-100 Compatibility

I can't see that the System 80 is any more compatible with the S-100 bus than is the TRS-80. Since there are a variety of TRS-80 to S-100 interface units available, you should check the prices of these before buying a machine.

Overall Impression

The initial price of the System 80 is somewhat less than a TRS-80. You can, with some reduction in visual quality, use an unmodifled tv as the video screen. If you are certain that you will not want to expand past the 16K machine it is a good buy.

I do not believe it is a good machine to expand beyond that point. The expansion unit costs more than the TRS-80 expansion interface. You have to pay an additional amount to get an S-100 memory card, and after that, you have only one S-100 slot left open for other expansion options. You would probably be better off getting the TRS-80 and one of the S-100 bus interface boards available for it, if you seriously want S-100 compatibility at the lowest possible cost. ■

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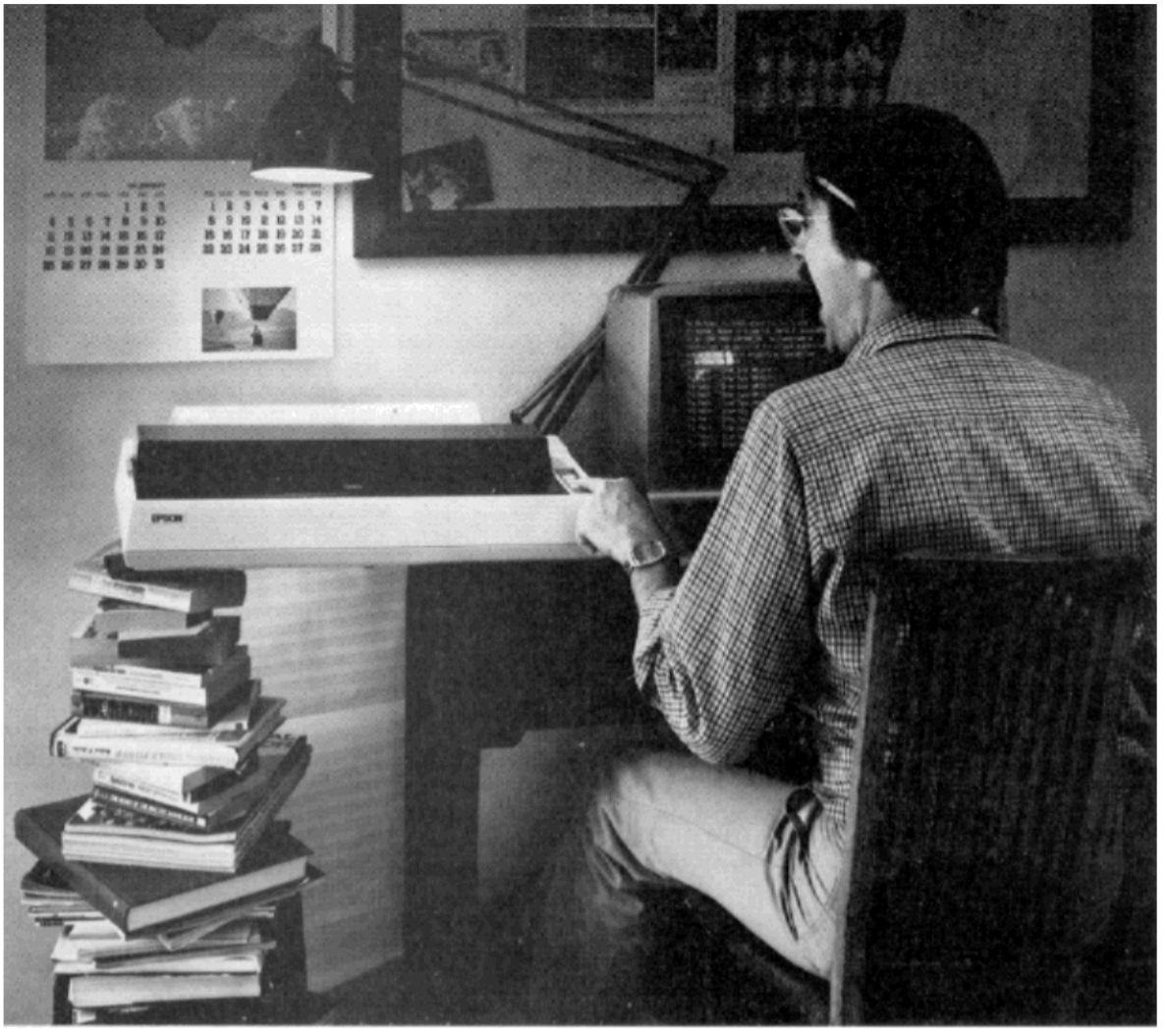

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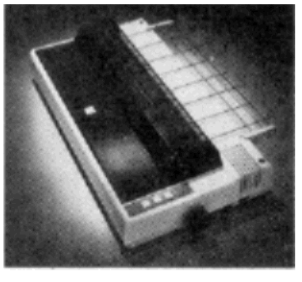

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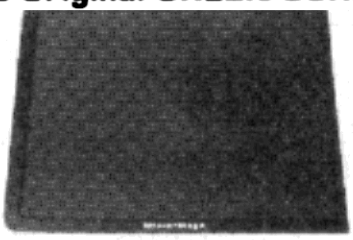

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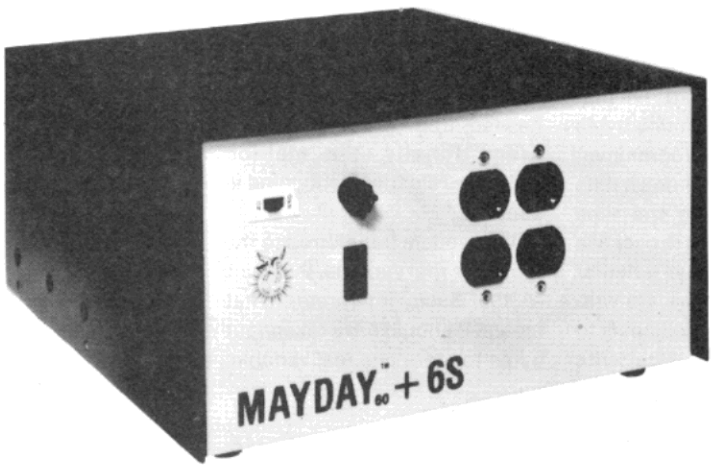

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Fill in the Blanks

Rober Schuldenfrei
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Like many other computer hobbyists, the basic TRS-80 processor is about all I can afford. Certainly it would be nice to have a printer and a whole bevy of disks, but at this time that's out of the question. Therefore, with just a 16K Level II machine, I set out to develop some useful software to make the most of my poverty.

The only storage device that is supplied with this machine is the much criticized cassette recorder. This does not look too bad at first, but there is a problem. All data written to tape is put on file in 256-byte records. This is a fixed record. Of that amount only the first 248 bytes are usable by the programmer. The start-up and shut-down time for the device bring the time cost to write a record to over five seconds. This is true whether one byte or 248 bytes are written. Therefore, the problem is to keep from doing a physical write until 248 bytes can be transferred.

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Method of Attack

Certain design criteria were used in writing the blocked I/O routines to solve the problem. First, there was a strong desire to stay away from machine language. Second, there's a need to drop these routines into any Basic program. Third, it should be fairly general so no changes are needed from program to program. Finally, the method should be clear so debugging is simple.

The module transferred to the file is the real variable, the heart of the Basic interpreter. That means it should have taken four bytes to store one real variable. As it turns out, only 31 real variables can fit on a 248-byte record. This is because what is placed on tape is the hexadecimal equivalent of the four bytes.

Since it takes two hex characters to code a byte, it takes eight characters to represent one real variable. Here is the cost of clarity. If binary images of the real variable could have been used, 62 real variables could have been packed into one record. This is harder to program and debug.

The routines are in the form of Basic subroutines of the GOSUB variety. For this reason unimaginative variable names were chosen. A dictionary of names is in Fig. 2. After some early housekeeping each time a variable is to be read or written, the user calls the appropriate subroutine. A buffer is used, and only when it is filled (or emptied on Reads) is the actual physical write performed. Fig. 1 shows the operation.

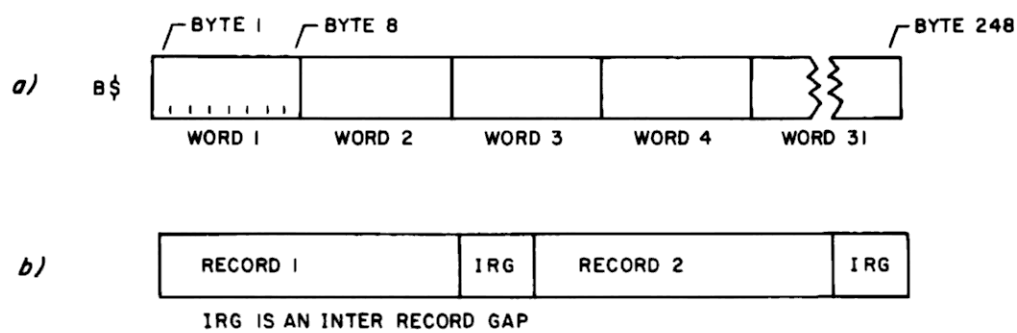

Fig. 1

Use of the Routines

Before describing the actual code, let us demonstrate the use of the procedure. Suppose one wanted to place the first 200 integers on tape. Without the blocked output routine this is al-

most impossible since the user would run off the end of the tape, not to mention the 20 minutes it would take. With the blocked output, seven writes and a little over 30 seconds are needed.

There are five things the user needs to do to use the blocked write. First, the main program must Clear, DIM and Defint some storage. The hex characters (0-F) must be stored in the H$( ) vector. Second, an initializing routine must be called once before the first write. Look at this as a file Open. Third, before each write the value to be written must be stored in the variable X. Fourth, call the output routine. Finally, a Close must be executed as the last file handling operation. Program Listing 1 is a listing of the above procedure. Program Listing 2 is the equivalent Read procedure.

Note that it is not necessary to close a Read file. If the user has two tape drives it is possible to read from one while performing Write to the second. This, however, requires a small change to the program.

How Blocked Write Works

The description of Write below is applicable to reading also. For detail on Read consult the remarks in Program Listing 3. The Write routine has been divided into four parts for clarity. Part one is the Open routine; its purpose is to initialize variables for later use. Part two fills the output buffer one variable at a time. Part three is the actual write to tape. Part four is a hex conversion routine that is handy in its own right.

Part one, Open, defines and initializes all Write variables. Note that all variables beginning with the letter K are integers for reasons of efficiency. In some cases this is required. The variable X must be established (the assignment is purely arbitrary) so that VARPTR(X) will not return an error. KO is set to zero so the first output Write will go into buffer word one.

In this description buffer word refers to the 31 eight-byte positions in the output string variable. The buffer itself is set to null. K2 holds the position in memory of the transfer variable X. Notice that this is the location and not the value of X. See Fig. 3.

At this point one should skip to the hex conversion routine, part four. Each byte has a high-order nibble (the left hex character) and a low-order nibble. For example F3 (decimal 243) has an F for a high-order nibble, and a 3 for a low-order nibble. Any decimal number in the range 0-255 can be converted to a hex number in the following manner. The high-order nibble is the integer division of the original number by 16.

Line 1170 performs this on the original number held in the variable K3. If K3 is 243, then K4 will be 15 and therefore H$(K4) will be F. The low-order nibble is a bit more complex. It is the remainder after the integer division, of the original number in K3 minus the integer division times 16—in the example 243 minus 240, or 3.

Of course H$(3) is also 3, but the data form is character. The sum of two strings in Microsoft Basic is concatenation, therefore 0$ contains the full byte in line 1180. In the example 0$ equals F plus 3, or F3.

With this concept in mind, observe part two. Line 1030 increases the word count by one. The routine is about to add eight more characters, two at a time, to the output buffer B$. The loop 1040 through 1080 takes each of the four bytes of the locations where X is stored and converts them to hex. This is appended to B$. Fig. 3 shows graphically how this is done.

Basic stores X somewhere in memory. K2 from the Open routine has the value (points to) the low-order byte of X. Remember that real variables like X are stored in four byte locations in low-order to high-order sequence. Starting from the high-order end of X (K2 + 3) to the low order end (K2 + 0) each byte of X is peeled off. That is the job of the PEEK (K2 + K1) in line 1050.

Since PEEK returns a decimal value, one is forced to make use of the hex conversion routine. A byte in decimal form was just what the hex routine wanted. It obliged by returning the byte in hex stored in O$. Each of four times the two-nibble O$ is concatenated to B$ for the required eight characters.

The only remaining chore is to recognize when 31 words have been added to B$. Since K0 is

Dictionary of Variables

K0	Output buffer pointer, number of words written
K1	Utility loop variable
K2	A pointer to the transfer variable X
K3	Decimal value of one byte of a real variable X
K4	Temporary variable in hex conversion
K5	Input buffer pointer
K6	Utility loop variable
K7	Decimal byte value temporary variable
K8	Decimal byte value temporary variable
K9	Length in words of the read string (usually 31)
X	Transfer variable
B$	Output buffer
C$	Input buffer
H$( )	Characters of the hex code
0$	Temporary holding string for one byte

Fig. 2

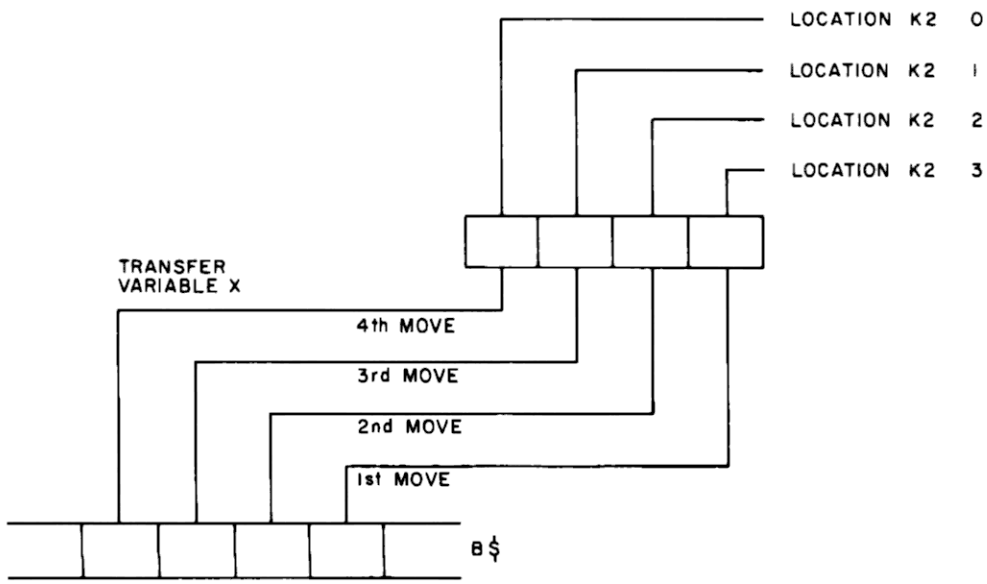

Fig. 3

keeping track, a check in 1090 will indicate when a physical write to tape must be done. If a physical write is not necessary a return to the main program is executed.

Part four, the physical write, is the last part of this routine. Line 1120 is included because part four is also the Close subroutine. Line 1130 is the real write. The GOSUB in 1140 resets the pointer K0 to 0 and B$ to null. Now the system is ready to refill the buffer. The need for the Close subroutine is apparent if you realize there is only one chance in 31 the data will fill exactly one buffer, no more, no less. Therefore, the last, partly filled buffer must be written before ending or some of the data will be lost. Line 1120 is necessary just in case there was a physical write just before ending.

To keep this article from consuming the whole magazine the Read routine will not be detailed. There are comments in the listing and technically it is the reverse operation.■

```
100 DEFINT I,K     'DECLARE INTEGER
110 CLEAR 600      'RESERVE STRING STORAGE
120 DIM H$(15)     'RESERVE VECTOR SPACE
130 FOR I= 0 TO 15: READ H$(I): NEXT I    'READ HEX CHARACTERS
140 DATA 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
150 GOSUB 1205     'CALL OPEN
160 FOR I= 1 TO 200      'CREATE 200 NUMBERS
170 GOSUB 1220    'CALL READ
180 Z= X          'TRANSFER READ VALUE
185 PRINT Z
190 NEXT I         'NEXT NUMBER
200 END
1200 'BLOCK READ
1205 X=0: K2=VARPTR(X)              'SAVE LOCATION OF X
1210 K5=0: C$="": RETURN            'INITIALIZE BUFFER
1220 IF K5= 0 GOSUB 1350            'IF EMPTY, PHYSICAL READ
1230 FOR K6= 0 TO 3                 'FOR EACH BYTE OF X
1240 O$= MID$(C$,8*(K9-K5)+K6*2+1,2) 'PEEL 2 HEX CHARACTERS
1250 K7= ASC(O$)                    'CONVERT LEFT NIBBLE TO ASC
1260 IF K7<58 K7= K7-48 ELSE K7= K7-55 'ASCII TO DECIMAL
1280 K8= ASC(RIGHT$(O$,1))          'CONVERT RIGHT NIBBLE TO ASC
1290 IF K8<58 K7= K7*16+K8-48 ELSE K7= K7*16+K8-55 'ASC TO DEC
1300 POKE K2+3-K6,K7                'STORE IN BYTE OF X
1310 NEXT K6                        'NEXT BYTE
1320 K5= K5-1                       'DECRIMENT WORD COUNT
1330 RETURN                         'DONE
1340 'PHYSICAL READ
1350 INPUT #-1,C$                   'PHYSICAL READ
1360 K5= LEN(C$)/8                  'ACTUAL RECORD LENGTH
1365 K9= K5                         'STORE LENGTH
1370 RETURN                         'DONE
```

Program Listing 1.

```
100 DEFINT I,K     'DECLARE INTEGER
110 CLEAR 600      'RESERVE STRING STORAGE
120 DIM H$(15)     'RESERVE VECTOR SPACE
130 FOR I= 0 TO 15: READ H$(I): NEXT I    'READ HEX CHARACTERS
140 DATA 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
150 GOSUB 1005     'CALL OPEN
160 FOR I= 1 TO 200      'CREATE 200 NUMBERS
170 X= I           'LOAD TRANSFER VARIABLE
180 GOSUB 1030     'CALL WRITE
190 NEXT I         'NEXT NUMBER
200 GOSUB 1120     'CALL CLOSE
210 END
1000 'BLOCK WRITE
1005 X=0: K2= VARPTR(X)          'SAVE LOCATION OF X
1010 K0=0: B$="": RETURN         'INITIALIZE BUFFER
1020 'LOAD BYTES
1030 K0= K0+1                     'INCRIMENT WORD COUNT
1040 FOR K1= 3 TO 0 STEP -1       'FOR EACH BYTE OF X
1050 K3= PEEK(K2+K1)              'PEEL A BYTE OF X
1060 GOSUB 1170                   'CALL HEX CONVERSION
1070 B$= B$+O$                    'CONCATINATE TO BUFFER
1080 NEXT K1                      'NEXT BYTE OF X
1090 IF K0=31 GOSUB 1120          'IF BUFFER FULL, CALL WRITE
1100 RETURN                       'DONE
1110 'PHYSICAL WRITE
1120 IF B$="" RETURN              'IF NULL, NO WRITE NECESSARY
1130 PRINT #-1,B$                 'ACTUAL WRITE TO TAPE
1140 GOSUB 1010                   'INITIALIZE BUFFER
1150 RETURN                       'DONE
1160 'HEX CONVERSION
1170 K4= INT(K3/16)               'LEFT NIBBLE
1180 O$= H$(K4)+H$(K3-K4*16)      'FORM WHOLE BYTE
1190 RETURN
```

Program Listing 2.

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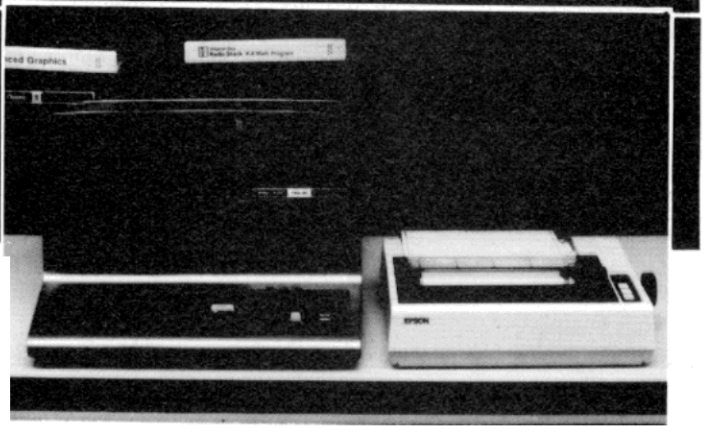

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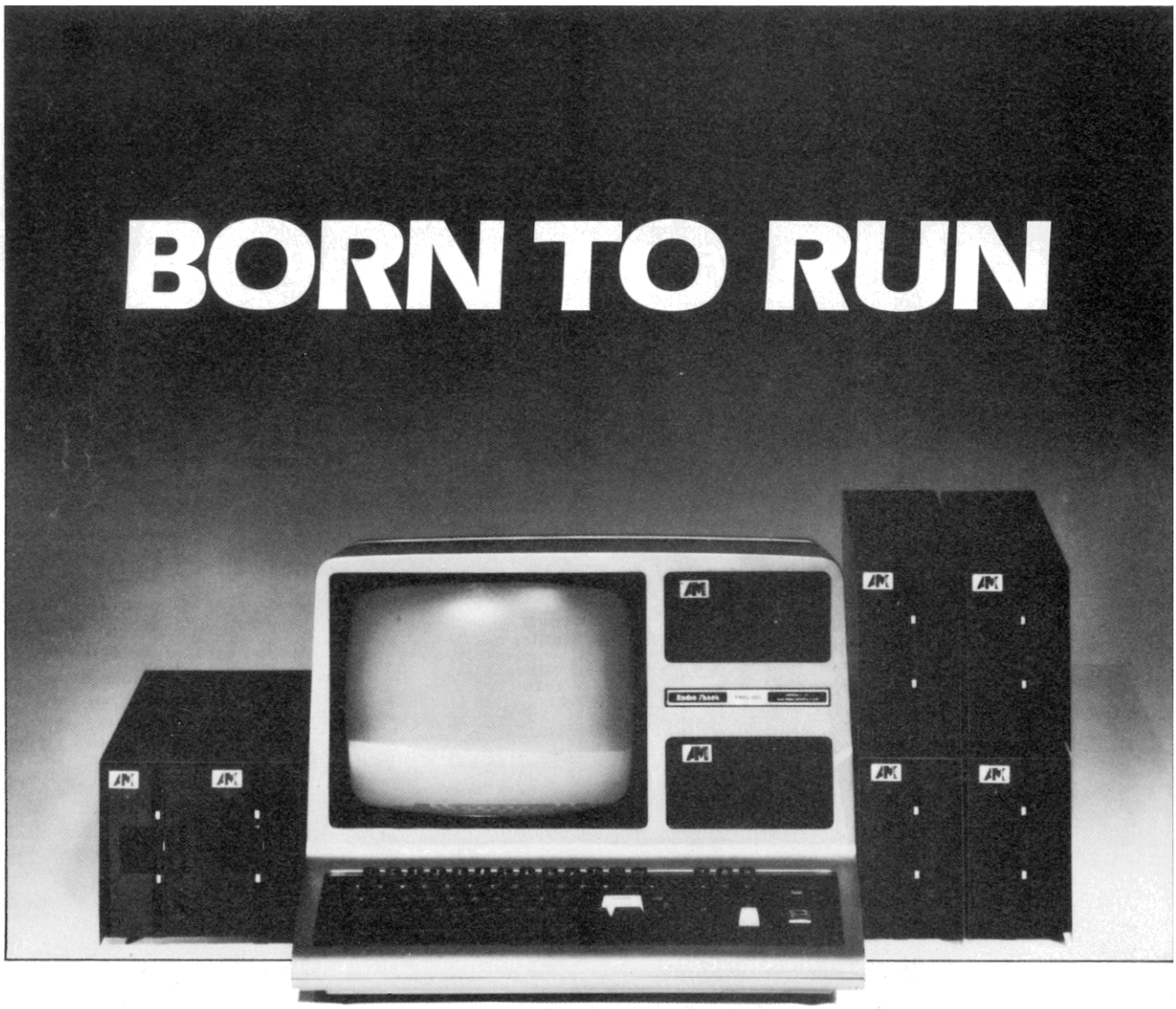

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Another Major Operation on Scripsit

Lynn W. Graves
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I have been an Electric Pencil lover for the past six months, but I must admit to a few dislikes which have developed along the way. Much to my surprise, Radio Shack's Scripsit has eliminated most of these irritating factors. Here are five of my reasons for abandoning my Pencil for Scripsit:

- When printing a multiple page text with Scripsit, you can print odd numbered pages, turn the paper over and then print the even numbered pages on the back.
- You can print a single page at a time (computer pauses while you insert the next single sheet of paper).
- Scripsit doesn't miss a character when it starts a new line of text while you are typing fast.
- Scripsit has typewriter TAB features.
- The Scripsit viewing window feature allows the text to appear on the screen just as it would appear on the printer (no more guessing and tedious counting for 80 characters per line).

As with most unusual endeavors, this project is an example of the old cliche "necessity is the mother of invention." Since word processing consumes less than 10 percent of my computer time, I cannot justify a $3000 high-speed letter quality printer. For the other 90 per cent of my computer time I cannot cope with a 100 word per minute printer.

The obvious solution is to use a high-speed dot matrix printer for both proof printing (finding those mistakes that never get noticed on the video screen) and other high volume printing operations. Final word processor copy will be printed with a low cost I/O Selectric typewriter.

Radio Shack's Scripsit word processor will drive parallel and serial printers with the selective print commands. The rub comes when you discover that Scripsit serial print capability requires the use of Radio Shack's RS232C UART card. Since I have been using a Selectric driver routine through the cassette audio cable, I did not relish the thought of buying an RS232C UART card and then modifying my Selectric driver to be compatible with the UART card. The added trouble of changing cables and connectors contributes to the annoyance.

All software simulated UARTs, including TRS232, Teletype drivers, and Selectric drivers are not compatible with Scripsit.

This project is divided into five parts for ease of understanding:

- Determine how Scripsit works with serial and parallel printers.
- Make preliminary modifications to Scripsit for using your driver.
- Evaluate various aspects of serial printer driver software (UART simulators).
- Construct a user oriented program which will patch a custom driver into Scripsit.
- Devise a method of saving this custom Scripsit program on disk using no more than Level II Basic and Radio Shack's DOS system.

Part One

Since Scripsit is loaded with DOS it will probably load starting at 5200H. My favorite monitor program, RSM2, reveals that it does start at 5200H and ends at 7AA4H. Next question, what is the entry point for Scripsit? I tried the obvious and entered at 5200H and it worked. If this had not been the entry point, I could have used the NEWDOS + 'LMOFF SET' or a tape to disk program called 'DCV' to locate the entry address.

Radio Shack's Level II Reference Manual specifies that 37E8H is the line printer port. It also specifies 4025H through 402CH as the line printer control block. Bytes 4026H and 4027H contain the ROM printer driver address upon powerup of your system. If you PEEK these two bytes you will discover the entry address for the ROM driver is 058DH.

When RSM2 was used to hunt for 058DH in Scripsit, it was not found, which indicates that Scripsit contains its own driver routine. This seems logical if Scripsit is to be used with the Model II since it contains none of the Level II ROM chips. To establish just where Scripsit does handshake with the parallel printer I searched next for all locations of 37E8H. It was found eight times (see Table 1).

With proof that Scripsit contains its own parallel printer driver, the next task is to determine how Scripsit interfaces with the RS232C UART card. To

initialize the UART, the TRS-80 must generate a master reset pulse (OUT E8H) and then read the UART switch settings (Table 2 shows this routine). Notice the last two instructions, an FFH flag is set at 7C62H address. This flag will be tested each time Scripsit outputs data to the serial printer. If this flag is other than OOH, Scripsit assumes UART initialization has been completed and skips the initialization process shown at 6611H (Table 2). Scripsit simply outputs serial characters as long as the printer is ready for more.

Output of these serial characters to the UART requires an (OUT EBH) instruction. First however, Scripsit must test to see if the UART has completed the last character print function. This is determined by using an (IN EAH) instruction shown at 5F87H (see Table 3). The call 6004 simply checks for a Clear key and if it is pressed, this routine returns you to Scripsit text cursor. This is a nice feature if you accidentally try to print when no printer is connected. With Electric Pencil, the system would lock up and you would lose all the text that had been typed. With Scripsit you just press Clear and everything is normal again. When the UART status is ready, bit six of the accumulator is set and the wait loop is broken at address 5F8BH (Table 3). Now Scripsit can output the next serial character to the UART transmit data register. This is accomplished with an (OUT EBH) instruction which is found at two locations in Table 3.

An Operational Test

If we change address 6611H from a COH (return if not zero) to a C9H (return), the Scripsit program will no longer try to initialize the UART. And if we also change bytes 5F87H thru 5F8CH to 00H (NOPs), Scripsit will no longer test for a UART ready status. Scripsit will be fooled into believing it is successfully handshaking with an RS232C UART card which is handshaking with a serial printer. This test is performed

Program Listing 1

```
                00100
                00110 ;SCRIPSIT SERIAL PRINTER PATCH
                00120
                00130 ;AUTHOR   LYNN W. GRAVES
                00140
                00150 ;FOURTH REVISION   2 APRIL 1980
                00160
                00170 ;F SCRIPSIT/CMD:0 8200 AC74 AC60
                00180
7F00            00190          ORG     7F00H
7F00 210052     00200 START    LD      HL,5200H
7F03 110082     00210          LD      DE,8200H
7F06 01A428     00220          LD      BC,10404
7F09 EDB0       00230          LDIR                    ;BLOCK SCRIPSIT HIGH
7F0B 21197F     00240          LD      HL,WHAT
7F0E 1160AC     00250          LD      DE,0AC60H
7F11 010E00     00260          LD      BC,14
7F14 EDB0       00270          LDIR                    ;OPERATE BLOCK MOVE
7F16 C3277F     00280          JP      NEXT
7F19 210082     00290 WHAT     LD      HL,8200H
7F1C 110052     00300          LD      DE,5200H
7F1F 01762A     00310          LD      BC,10870
7F22 EDB0       00320          LDIR                    ;MOVE MODIFIED SCRIPSIT
                00330                                  ;TO OPERATING LOCATION
7F24 C30052     00340          JP      5200H           ;ENTER SCRIPSIT
7F27 CDC901     00350 NEXT     CALL    01C9H           ;CLEAR SCREEN
7F2A 214280     00360          LD      HL,MSG0
                00370
7F2D CDA728     00380          CALL    28A7H           ;DISPLAY COPYRIGHT
7F30 21FF80     00390 WHERE    LD      HL,MSG5
7F33 CDA728     00400          CALL    28A7H           ;DISPLAY LOCATION PROMPT
7F36 CDB31B     00410          CALL    1BB3H           ;INPUT ANSWER
7F39 D7         00420          RST     10H             ;FETCH ANSWER
7F3A FE59       00430          CP      59H             ;TEST FOR (Y)
7F3C 2808       00440          JR      Z,PETCH
7F3E FE4E       00450          CP      4EH             ;TEST FOR (N)
7F40 C2AB81     00460          JP      NZ,WHY          ;TRY AGAIN
7F43 C32E80     00470          JP      LOCTN
7F46 21547F     00480 FETCH    LD      HL,POKE
7F49 110082     00490          LD      DE,8200H
7F4C 011D00     00500          LD      BC,29
7F4F EDB0       00510          LDIR                    ;MODIFY SCRIPSIT TO FETCH
                00520                                  ;DRIVER ENTRY ADDRESS
                00530                                  ;FROM PRTR CONTROL BLOCK
7F51 C37A7F     00540          JP      CONT
7F54 3A2640     00550 POKE     LD      A,(4026H)       ;
7F57 321E66     00560          LD      (661EH),A       ;
7F5A 3A2740     00570          LD      A,(4027H)       ;
7F5D 321F66     00580          LD      (661FH),A       ;FETCH DRIVER ADDRESS
7F60 C33F52     00590          JP      523FH
7F63 FE0A       00600 NONO     CP      0AH             ;
7F65 C21652     00610          JP      NZ,5216H        ;
7F68 3E0D       00620          LD      A,0DH           ;
7F6A CD1266     00630          CALL    6612H           ;CHANGES L/F TO C/R
7F6D C9         00640          RET
7F6E C37A7F     00650          JP      CONT
7F71 DD2A5D7C   00660 RESTOR   LD      IX,(7C5DH)      ;MEMORY SIZE TO IX
7F75 00         00670          NOP
7F76 00         00680          NOP
7F77 C37652     00690          JP      5276H
7F7A 217D80     00700 CONT     LD      HL,MSG7
7F7D CDA728     00710          CALL    28A7H
7F80 CDB31B     00720          CALL    1BB3H
7F83 D7         00730          RST     10H
7F84 CD5A1E     00740          CALL    1E5AH           ;CONVERT MEM SIZE TO HEX
7F87 ED535DAC   00750          LD      (0AC5DH),DE     ;
7F8B ED5355AC   00760          LD      (0AC55H),DE     ;
7F8F ED532DAC   00770          LD      (0AC2DH),DE     ;STORE MEMORY SIZE
7F93 21717F     00780          LD      HL,RESTOR
7F96 116082     00790          LD      DE,08260H       ;
7F99 010900     00800          LD      BC,9            ;
7F9C EDB0       00810          LDIR                    ;BLOCK OUT MEM SCAN
7F9E 3EC9       00820          LD      A,0C9H
7FA0 321196     00830          LD      (9611H),A
7FA3 3E00       00840          LD      A,00            ;ZERO FOLLOWING BYTES
7FA5 32878F     00850          LD      (8F87H),A
7FA8 32888F     00860          LD      (8F88H),A
7FAB 32898F     00870          LD      (8F89H),A
7FAE 328A8F     00880          LD      (8F8AH),A
7FB1 328B8F     00890          LD      (8F8BH),A
7FB4 328C8F     00900          LD      (8F8CH),A
7FB7 322297     00910          LD      (9722H),A
7FBA 322397     00920          LD      (9723H),A
7FBD 322497     00930          LD      (9724H),A
7FC0 322597     00940          LD      (9725H),A
7FC3 322697     00950          LD      (9726H),A
7FC6 325D8F     00960          LD      (8F5DH),A
7FC9 3ECD       00970          LD      A,0CDH          ;
7FCB 325A8F     00980          LD      (8F5AH),A       ;
```

Program continues

Program continues

```
7FCE 3E12     00990          LD      A,12H           ;
7FD0 325B8F   01000          LD      (8F5BH),A       ;
7FD3 3E66     01010          LD      A,66H           ;
7FD5 325C8F   01020          LD      (8F5CH),A       ;STUFF ACCESS DRIVER
7FD8 C3F27F   01030          JP      GUESS
7FDB E67F     01040 GISMO    AND     7FH             ;THIS ROUTINE WILL MOVE
7FDD 4F       01050          LD      C,A             ;A TO C, SAVE THE
7FDE F5       01060          PUSH    AF              ;ENVIRONMENT AND CALL
7FDF E5       01070          PUSH    HL              ;YOUR DRIVER
7FE0 D5       01080          PUSH    DE
7FE1 C5       01090          PUSH    BC
7FE2 DDE5     01100          PUSH    IX
7FE4 FDE5     01110          PUSH    IY
7FE6 00       01120          NOP
7FE7 00       01130          NOP
7FE8 00       01140          NOP
7FE9 FDE1     01150          POP     IY
7FEB DDE1     01160          POP     IX
7FED C1       01170          POP     BC
7FEE D1       01180          POP     DE
7FEF E1       01190          POP     HL
7FF0 F1       01200          POP     AF
7FF1 C9       01210          RET
7FF2 21DB7F   01220 GUESS    LD      HL,GISMO
7FF5 111296   01230          LD      DE,9612H
7FF8 011700   01240          LD      BC,23
7FFB EDB0     01250          LDIR                    ;SAVE 'ENVIRONMENT' MOD.
7FFD 3ECD     01260          LD      A,0CDH
7FFF 321D96   01270          LD      (961DH),A
8002 21AB80   01280 WHER     LD      HL,MSG8         ;LINE-FEED PROMPT
8005 CDA728   01290          CALL    28A7H
8008 CDB31B   01300          CALL    1BB3H
800B D7       01310          RST     10H
800C FE59     01320          CP      59H
800E CA2B80   01330          JP      Z,EXIT
8011 FE4E     01340          CP      4EH
8013 C2B681   01350          JP      NZ,WH
8016 21637F   01360          LD      HL,NONO         ;INSERTS 'NONO' ROUTINE
8019 110F82   01370          LD      DE,820FH        ;WHEN YOU ANSWER (N) (N)
801C 010B00   01380          LD      BC,11           ;TO THE PROMPTS
801F EDB0     01390          LDIR
8021 3E0F     01400          LD      A,0FH           ;CHANGES CALL TO 520FH
8023 325B8F   01410          LD      (8F5BH),A       ;FOR L/F TO C/R
8026 3E52     01420          LD      A,52H
8028 325C8F   01430          LD      (8F5CH),A
802B C30000   01440 EXIT     JP      0000H           ;BOOT DOS FOR TAPEDISK
802E 217781   01450 LOCTN    LD      HL,MSG6
8031 CDA728   01460          CALL    28A7H
8034 CDB31B   01470          CALL    1BB3H
8037 D7       01480          RST     10H
8038 CD5A1E   01490          CALL    1E5AH           ;CONV DECIMAL TO HEX
803B ED53E77F 01500          LD      (7FE7H),DE      ;PRINTER DRIVER ADDRESS
803F C37A7F   01510          JP      CONT
8042 53       01520 MSG0     DEFM    'SCRIPSIT SERIAL PRINTER PATCH'
805F 0D       01530          DEFB    0DH
```

Program continued

with no printers connected. Scripsit tests for text errors then outputs the text buffer to the false UART and return (as it normally is) with the text cursor. There is one small blemish though, if you try to use the parallel print command with the parallel printer not ready, you will not get a not ready prompt and the program will lock up. This is easily corrected by pressing Clear which will return Scripsit to normal operation.

This part of the project is complete when you replace the contents of bytes 5F5AH thru 5F5DH with a call to your driver followed by a NOP. If you try to use your driver at this time, it will probably not work. This is because the driver will use some of the Z80 internal registers. If your driver doesn't save the contents of these registers, Scripsit will crash when your driver returns to it. The solution to this little problem will be covered in part three.

Saving Registers

Most serial printer driver routines have at least three things in common:

• They are compatible with either Level II Basic or DOS Ready. This means they must POKE their entry address into the Line Printer Control Block. These drivers normally use the

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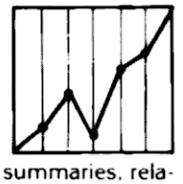

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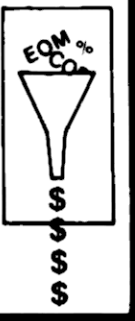

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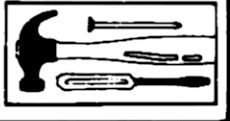

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Program continues

```
8060 28         01540           DEFM    '(C) 1980 BY LYNN W. GRAVES'
807A 0D         01550           DEFB    0DH
807B 0D         01560           DEFB    0DH
807C 00         01570           DEFB    00H
807D 0D         01580 MSG7      DEFB    0DH
807E 0D         01590           DEFB    0DH
807F 49         01600           DEFM    'INPUT YOUR REQUIRED MEMORY SIZE IN DECIMAL
'
80AA 00         01610           DEFB    00H
80AB 0D         01620 MSG8      DEFB    0DH
80AC 0D         01630           DEFB    0DH
80AD 44         01640           DEFM    'DOES YOUR SERIAL PRINTER DRIVER RECOGNIZE A
ND PROVIDE'
80E2 0D         01650           DEFB    0DH
80E3 45         01660           DEFM    'ENOUGH TIME FOR LINE FEEDS '
80FE 00         01670           DEFB    00H
80FF 57         01680 MSG5      DEFM    'WILL THE PRINTER CONTROL BLOCK CONTAIN THE
SERIAL DRIVER'
8137 0D         01690           DEFB    0DH
8138 45         01700           DEFM    'ENTRY ADDRESS DURING FUTURE USE OF THIS CUS
TOM SCRIPSIT'
816F 0D         01710           DEFB    0DH
8170 28         01720           DEFM    '(Y/N) '
8176 00         01730           DEFB    00H
8177 0D         01740 MSG6      DEFB    0DH
8178 0D         01750           DEFB    0DH
8179 49         01760           DEFM    'INPUT THE DECIMAL ENTRY ADDRESS OF YOUR DRI
VER '
81A8 00         01770           DEFB    00H
81A9 0D         01780 HOW       DEFB    0DH
81AA 00         01790           DEFB    00H
81AB 21A981     01800 WHY       LD      HL,HOW          ;RESTORE CURSOR POSITION
81AE CDA728     01810           CALL    28A7H
81B1 C3307F     01820           JP      WHERE           ;REPEAT PROMPT
81B4 0D         01830 HO        DEFB    0DH
81B5 00         01840           DEFB    00H
81B6 21B481     01850 WH        LD      HL,HO           ;RESTORE CURSOR POSITION
81B9 CDA728     01860           CALL    28A7H
81BC C30280     01870           JP      WHER            ;REPEAT PROMPT
7F00            01880           END     START
00000 TOTAL ERRORS
```

ROM line printer routine to perform such chores as keeping track of the characters per line and lines per page. This process of POKEing the driver entry address and maximum characters per line count into the Line Printer Control Block is known as initializing the driver. This initialization is usually performed when the driver is first loaded, followed by a jump to either Level II Basic or DOS Ready.

• Because most drivers are compatible with Basic, they are located in the attic (highest available RAM) where they are out of the way. This necessitates a protective memory size setting to prevent Basic from writing over your driver.

• Many drivers do not save the environment (information in the Z80 internal registers which will be used by the driver routine) and which causes the Scripsit program to crash when it finds unnatural data within its registers. Most drivers as-

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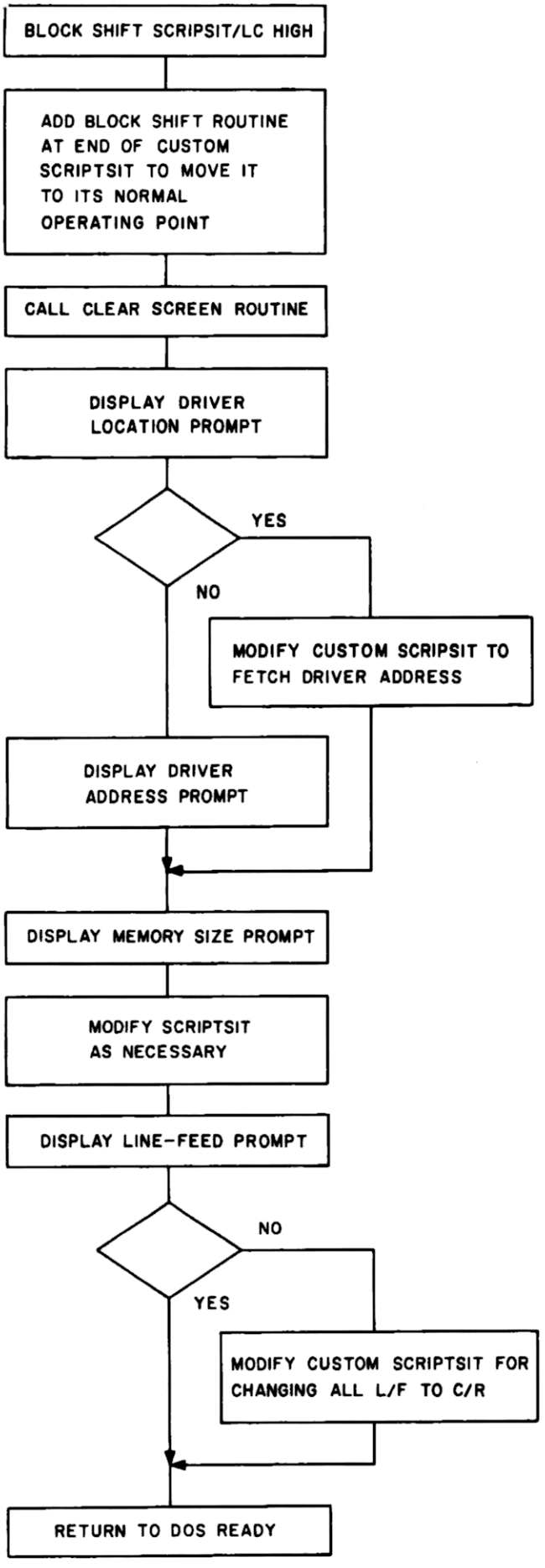

Fig. 1. Scripter Flow Chart

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sume the next character will be found in the C register. Guess what? Scripsit leaves this character in the accumulator. Therefore the custom Scripsit must move the output character into the C register and it must also save the environment before calling your driver routine.

Serial printer drivers have an uncommon feature which is the ability to recognize a linefeed. Scripsit uses linefeeds to advance the paper; some drivers will recognize linefeeds but won't allow sufficient time for the mechanics of the operation. Therefore custom Scripsit must provide conversion of all linefeeds to carriage returns when applicable.

Item two, above, is a very large burr under the ole saddle! How does Scripsit recognize your protective memory size setting? It doesn't. As your text size approaches your maximum available RAM, Scripsit will write over your driver rendering it useless.

Radio Shack never mentioned that memory size minus two is stored at addresses 40B1H and 40B2H. A quick check with RSM2 reveals that Scripsit never uses these addresses. A close inspection of the first 57 bytes of Scripsit execution discloses a Search For Memory Size Routine within addresses 5260H and 5275H inclusively (See Table 4). This routine starts with address FFFFH, reads its contents, complements the contents, writes the complemented value back to the address, and then exclusive ORs what is read the second time with what was read the first time. If any difference exists, the zero test fails and the next lower address is tested. When the test finds an address that can be written to, it considers this to be the maximum memory size for your system. This memory size is stored at 7C5DH, 7C55H, 7C2DH and is also placed in the IX register pair.

```
5242:  3E 0A        LD   A,0A          ;
5244:  32 E8 37     LD   (37E8),A      ;output a line-feed

5F60:  CD 04 60     CALL 6004          ;test for clear key
5F63:  3A E8 37     LD   A,(37E8)      ;input printer status
5F66:  CB 7F        BIT  7,A           ;test printer status
5F68:  20 F6        JR   NZ,5F60       ;loop til ready

663F:  3A E8 37     LD   A,(37E8)      ;input printer status
6642:  E6 F0        AND  F0            ;mask bits
6644:  FE 30        CP   30            ;test printer status
6646:  28 14        JR   Z,665C        ;jump if ready
6648:  3E 0C        LD   A,0C          ;form feed, not ready
664A:  CD 7C 6F     CALL 6F7C
664D:  CD 04 60     CALL 6004          ;test for clear key
6650:  3A E8 37     LD   A,(37E8)      ;input printer satus
6653:  E6 F0        AND  F0            ;mask bits
6655:  FE 30        CP   30            ;test printer status
6657:  20 F4        JR   NZ,664D       ;loop if not ready
6659:  CD E9 6B     CALL 6BE9          ;clear bottom line
665C:  3E 0D        LD   A,0D
665E:  32 E8 37     LD   (37E8),A      ;output C/R

6720:  3E 0D        LD   A,0D
6722:  32 E8 37     LD   (37E8),A      ;output C/R
6725:  D3 EB        OUT  EB            ;output C/R to UART

7A95:  3E 20        LD   A,20
7A97:  32 E8 37     LD   (37E8),A      ;output a space
7A9A:  08           EX   AF,AF'
7A9B:  C3 74 5F     JP   5F74          ;update control block
7A9E:  32 E8 37     LD   (37E8),A      ;output A to printer
7AA1:  C3 74 5F     JP   5F74          ;update control block
```

Table 1. Parallel Printer Handshaking

```
660D:  3A 62 7C     LD   A,(7C62)      ;fetch init. flag
6610:  B7           OR   A             ;set flags
6611:  C0           RET  NZ            ;initialization done
6612:  FD CB 0E 4E  BIT  1,(IY+0E)     ;start initialization
6616:  28 27        JR   Z,663F
6618:  D3 E8        OUT  E8
661A:  DB E9        IN   E9
661C:  E6 F8        AND  F8
661E:  F6 04        OR   04
6620:  D3 EA        OUT  EA
6622:  DB E9        IN   E9
6624:  E6 07        AND  07
6626:  21 0F 6B     LD   HL,6B0F
6629:  06 00        LD   B,00
662B:  4F           LD   C,A
662C:  09           ADD  HL,BC
662D:  7E           LD   A,(HL)
662E:  D3 E9        OUT  E9
6630:  DB EA        IN   EA
6632:  FE FF        CP   FF
6634:  3E 08        LD   A,08
6636:  CA 6E 70     JP   Z,706E
6639:  3E FF        LD   A,FF
663B:  32 62 7C     LD   (7C62),A      ;set init. flag
663E:  C9           RET                ;initialization done
```

Table 2. UART Initialization Routine

Machine-Language Program

Since many TRS-80 users have little skill using Assembly programs, I decided to construct a machine-code program which would make all the necessary changes based on a few prompts which most operators can answer. This Scripsit patch program, named SCRPTR, will link the user's driver to Scripsit. SCRPTR will reside on cassette for ease in mailing.

Because Radio Shack's TapeDisk program overlaps with Scripsit, the custom Scripsit will be located and modified at addresses 8200H-AC74H. This way TapeDisk can be used to save custom Scripsit on disk. See Fig. 1 for a flow chart of the SCRPTR program. Notice that SCRPTR first blockshifts Scripsit/LC into high RAM. Then it adds a blockshift at the end of Scripsit/LC. This blockshift is the entry point for the custom Scripsit. Once loaded into high RAM, its function is to move custom Scripsit down to its normal operating position. The remainder of the flow chart is self explanatory.

One word of warning: These ROM routines act crazy when DOS vectors are present. This is a result of Basic Exit Vectors (see *80 Microcomputing*, February 1980). Since I will be executing SCRPTR from Level II Basic, these DOS vectors will not be present.

Fig. 2 is a source listing of SCRPTR, compiled using the enhanced version of Radio Shack's Editor/Assembler found in NEWDOS+. The liberal comments should ease some of the anguish of following this unorthodox program. It is now time to type in the source listing with an Editor/Assembler or POKE in the opcode for this SCRPTR program.

How to Use SCRPTR

To suffice with using only Level II Basic and Radio Shack's disk operating system for construction of this custom Scripsit requires an exacting sequence of operations. For the benefit of all newcomers, I will explain how to answer the prompts.

Answering Prompts

The first prompt will ask: "Will the printer control block contain the serial driver entry address during future use of this custom Scripsit? Indicate yes or no."

If your serial driver automatically initializes and returns your system to DOS Ready, you may answer yes. If your serial driver requires operator input to initialize, you may answer no which will preclude future operator input for your driver.

If your serial driver has a speed menu, such as 100, 75, 60 words per minute teletype, you must input this speed selection each time your driver is initialized. A yes answer would be your logical choice for this situation.

If you are not sure of the entry address of your driver, answer yes and the custom Scripsit will fetch this information from the line printer control block each time custom Scripsit is executed. Of course this necessitates initialization of your driver prior to each loading of custom Scripsit. After you answer yes or no hit Enter.

If you answered no to the first prompt, your next prompt will ask: "Input the decimal entry address of your driver?" Input the correct response and press Enter.

The next prompt will ask: "Input your required memory size in decimal?" Normally this is the memory size to protect your driver which is located above Scripsit. If your driver is located below 20992 you have to enter the maximum memory size of

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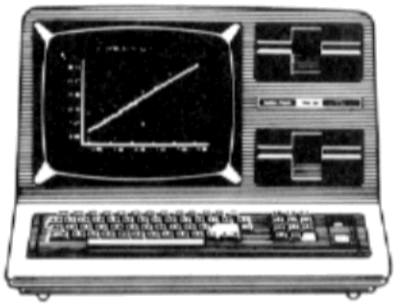

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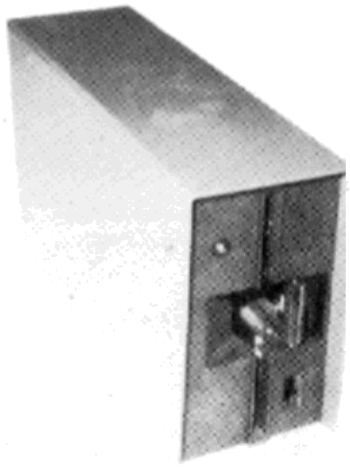

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your system for this prompt.

The last prompt will ask: "Does your serial printer driver recognize and provide enough time for linefeeds? yes or no."

If your driver does not manage linefeeds properly, simply answer no and your custom Scripsit will convert all linefeeds to carriage returns Answer yes otherwise.

Assembling A Custom Scripsit

These instructions will direct you in assembling a custom Scripsit and saving it on disk. These instructions are based on using Radio Shack's disk operating system which includes Debug and Tapedisk.

The preliminary steps are:

- Powerup your system and hold Break while pressing Reset. This will place your system into Level II Basic. Press Enter, type System and press Enter again.
- Place the SCRPTR tape in your recorder and then type SCRPTR and Enter. This will start the tape loading.
- You may have to experiment with the volume control to achieve a proper load. Once you have established the proper volume level and have achieved several successful loads, rewind the tape and shut off the system.
- Powering down your system is very important because bad loads can POKE data anywhere in memory.

These are the steps for assembling the custom Scripsit:

- Turn on your system.
- Boot DOS Ready.
- Type Debug and Enter.
- Type SCRIPSIT/LC and Enter.
- Your screen will fill with data. Ignore this data, hold Break and press Reset. This will return your system to Level II Basic. Now press Enter.
- Type System and press Enter.
- Prepare SCRPTR tape for loading. Then type SCRPTR and Enter.
- When the tape load is complete, type '/' and Enter.
- This will display SCRPTR prompts. When you have answered the last prompt your system will boot DOS Ready.
- Type Tapedisk and Enter which will load it and display a question mark.
- Type F SCRIPSIT/CMD:0 8200 AC74 AC60 and Enter.
- Your system will now save your custom Scripsit on disk.
- When the disk save ends you will get another question mark. Type E and Enter. This concludes assembling and placing your custom Scripsit onto disk.

Now you can use your custom Scripsit. If you answered yes for the first prompt, turn on the system and boot DOS Ready. Then, filespec for your driver and initialize it. Lastly, filespec Scripsit. Don't forget to use the serial print commands.

If you answered no to the first prompt, follow the same steps for yes but do not initialize the driver.

Problems

Most problems will fall within three areas: tape loading problems; custom Scripsit locks up when (P,S) command is used; and/or the printer will not linefeed properly.

Tape loading problems are normally attributed to cassette head alignment errors. Your SCRPTR tape should be recorded several successive times to reduce loading problems. If you can't get a good load after experimental volume settings, reassemble a new tape copy of SCRPTR.

If your custom Scripsit locks up when you use the (P,S) command and the cursor doesn't return after you hold the Clear key, this indicates that your driver entry address was not in the line printer control block, or you previously entered the wrong driver address. Do you have your driver loaded? If the line printer control block is your problem, assemble another custom Scripsit and answer no to the first prompt.

Linefeed problems are a result of one of two possibilities. Your serial driver doesn't recognize linefeeds or it recognizes them but doesn't provide enough time for the mechanics of the linefeed. This problem is corrected by answering no to the last prompt.

You should now have a reasonable understanding of how to interface your particular serial printer driver to the disk version of Scripsit. ■

A cassette version of SCRPTR may be obtained from the author.

```
5F59:  08           EX   AF,AF'       ;restore accumulator
5F5A:  E6 7F        AND  7F           ;mask graphics chrtrs
5F5C:  D3 EB        OUT  EB           ;out data to Uart
5F5E:  18 14        JR   5F74         ;update control block

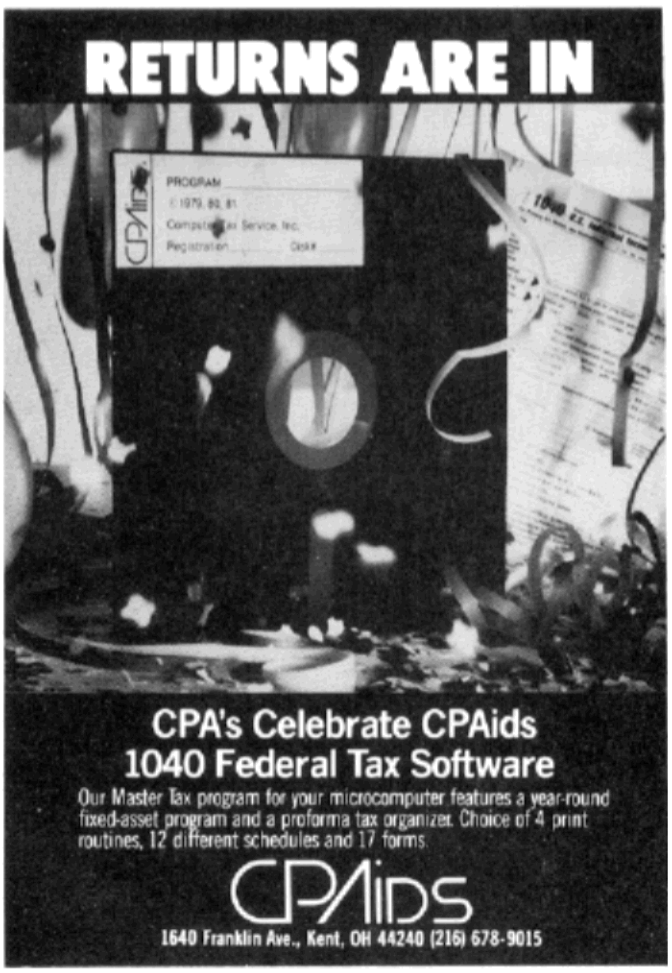
5F84:  CD 04 60     CALL 6004         ;test for clear key
5F87:  DB EA        IN   EA           ;input Uart status
5F89:  CB 77        BIT  6,A          ;test Uart status
5F8B:  28 F7        JR   Z,5F84       ;loop til ready

6720:  3E 0D        LD   A,0D
6722:  32 E8 37     LD   (37E8),A     ;output C/R
6725:  D3 EB        OUT  EB           ;out C/R to Uart
```

Table 3. UART Printer Routines

```
5260:  21 FF 00     LD   HL,00FF
5263:  25           DEC  H
5264:  7E           LD   A,(HL)
5265:  2F           CPL
5266:  77           LD   (HL),A
5267:  AE           XOR  (HL)
5268:  20 F9        JR   NZ,5263      ;loop til test fails
526A:  22 5D 7C     LD   (7C5D),HL
526D:  22 2D 7C     LD   (7C2D),HL
5270:  22 55 7C     LD   (7C55),HL
5273:  E5           PUSH HL           ;store HL contents
5274:  DD E1        POP  IX           ;fetch HL contents
                                      ;IX = memory size
```

Table 4. Memory Test Routine



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cassette

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Tape Spate

Bill Bowman
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After a challenge from a friend to shorten the length of time for cassette data saves and recoveries, I have come up with the following routines that will: reduce save and recovery times incredibly; reduce relay flicking (with no hardware); reduce the amount of cassette tape required; and allow verification of data saves.

No matter how short your Print# – 1 statement is, it will take at least five seconds to record that item. In my example I save 500 six-digit items contained in Super Strings, and then the same 500 items individually. Table 1 shows a very surprising comparison of times.

Refer to Program Listing 1 and try out the save-data routine. Because I didn't want to type in all the data, I used the random feature to do it for me. Because the data is contained within strings, it doesn't matter if the data is alphabetical, numeric or alpha-numeric. When you run the first listing you are asked to field your strings so it resembles a random save in Disk Basic. A considerable amount of time is taken up with the data generation and the formatting of strings; during an actual program run it will accept data as

```
100 CLEAR 20000
110 DIM A (500), B$ (25)
120 DEFINT J
130 CLS
140 PRINT@192,"WHAT IS THE LENGTH OF YOUR DATA STATEMENTS ";:INP
UT I
150 J=249/I
160 PRINT @ 192, STRING$ (63," ")
170 PRINT @ 210, "HOW MANY NUMBERS DO YOU WANT "; : INPUT A
180 DIM A$(A), D$(A), X(A)
190 PRINT @ 192, STRING$ (63," ")
200 CLS
210 D = 1
220 FOR X = 1 TO A
230 A$(X) = RIGHT$(STR$(RND(0)),I)
240 PRINT @ 210, "#";X;" ";A$(X)
250 B$(D) = B$(D) + A$(X)
260 PRINT @ 320, "STRING #";D;"IS ";B$(D);" "
270 PRINT @ 704,"THIS STRING IS";LEN(B$(D));"CHARACTERS LONG    "

280 IF X/J = INT(X/J) THEN D = D + 1
290 NEXT X
300 FOR X = 1 TO D
310 PRINT B$(X);" ";LEN(B$(X))
320 NEXT X
330 C = 1
340 Y = 1
350 FOR X = 1 TO A
360 D$(X) = MID$(B$(C),Y,I)
370 IF D$(X) = "" THEN X = A
380 PRINT X;" ";D$(X);
390 Y = Y + I
400 IF X/J = INT(X/J) THEN C = C + 1 : Y = 1
410 NEXT ¬
420 CLS
430 CMD "TIME 00:00:00
440 PRINT "TIME START LONG STRING SAVE: = ";RIGHT$(TIME$,5)
450 FOR X = 1 TO D
460 PRINT #-1, B$(X)
470 PRINT "TIME END STRING SAVE #";X;RIGHT$(TIME$,5)
480 NEXT X

500 FOR X = 1 TO 2000
510 NEXT X : PRINT RIGHT$(TIME$,5)
520 CMD "TIME 00:00:00
530 PRINT "TIME START NUMBER SAVE: = ";RIGHT$(TIME$,5)
540 FOR X = 1 TO A
550 PRINT #-1,D$(X)
560 PRINT X;" ";D$(X);" ";RIGHT$(TIME$,5)
590 NEXT X
600 PRINT "TIME END NUMBER SAVE: = ";RIGHT$(TIME$,5)
610 END
620 CLS : PRINT @ 465,"HIT ANY KEY TO VERIFY:"
630 I$=INKEY$ : IFI$="" GOTO 630
640 CLS : PRINT @ 465,"< STAND-BY >"
650 DIM Y$(25)
660 FOR X = 1 TO D
670 Y$(X) = B$(X)
680 B$(X) = ""
690 NEXT X
700 FOR X = 1 TO D
710 INPUT #-1,B$(X)
720 IF B$(X) = Y$(X) PRINT @ 465,"SUPER STRING";X;"IS OKAY"
730 IFB$(X)<>Y$(X)PRINT@465,"SUPER STRING";X;"IS NO GOOD";GOTO87
0
740 PRINT Y$(X)
750 NEXT X
760 CLS : PRINT @ 465,"YOUR DATA IS A-OK, HERE ARE THE NUMBERS"
770 Y = 1 : C = 1
780 FOR X = 1 TO A
790 D$(X) = MID$(Y$(C),Y,I)
800 IF D$(X) = "" THEN X = A
810 PRINT X;" ";D$(X);
820 Y = Y + I
830 IF X/J = INT(X/J) THEN C = C + 1 : Y = 1
840 NEXT X
850 CLS : PRINT @ 465,"YOUR DATA IS A-OK, PROCEED TO RELOAD":END

860 PRINT @ 465,"HIT 1 TO RE-TRY VERYIFY, ANYTHING TO RE-RUN"
870 I$ = INKEY$ : IF INKEY$ = "" GOTO 870
880 IF I$ = "1" THEN GOTO 700
890 RUN
```

Program Listing 1

you enter it except for a few delays as strings are exchanged in RAM storage.

I have expanded the program in an exaggerated manner to make it easier to follow. When you incorporate these routines into your own programs they should take up very few lines. Remember, the secret to fast program execution is a minimum of line numbers so try to get as close as possible to 255 characters per line.

Program Execution

As the first listing executes, you are asked for the length of your data entries. Since RND(0) only allows generation of six-digit numbers, you are limited to that as a maximum. To make full use of this routine, you must add trailing blanks so that all entries are the same length. The routines in Program Listings 4 and 5 accomplish this when you set up your own programs. These use the INKEY$ function, so you cannot enter too few or too many characters. The first is set up to accept only numeric data, the second looks for six 15-character entries, and Enter will fill the rest of the string with blanks. You can also erase an error by using Shift E. In the first example you load six six-digit numbers and then print the resulting super string.

In Program Listing 1 you are asked for the number of entries you wish to make. It then dimensions the strings so you do not exceed 255 characters, including the title which takes six character spaces. This leaves us with 249 usable spaces in each string. If your item statement is longer, reduce the number of usable bytes. As your entries fill the string, line 290 increments to the next string.

As the super strings are formed, you are told which string is being built and what its length is. After all your super strings are built, they are displayed and then torn apart again to show you the individual entries and their numbers. If you are using the real-time clock, you will not be able to save data at this time. If you do not have an expansion interface, then remove all CMD statements and references to TIME$.

For your first look at the time saving element, press play on your recorder without a tape installed. You will be told when the super strings are being saved. When they are finished, mark down the counter readout after the strings and then reset for the individual saves. After the data has been saved, execution of the program stops at line 160 as this is as far as we want to go at this time.

Now go back and start again with the time clock shut down and a fresh tape in the player. Wind past the leader, press record and play. Delete line 160 and run the program again with enough data to fill two or three super strings. The data will once again be saved, so be patient and let it all go out. If you don't want to wait through all the individual saves, then make the changes in Program Listing 3.

The verify data routine ensures a good save prior to powering down. There is no sense in verifying the individual data as we won't use that antiquated routine again. When the data has been saved, rewind the tape and press the play button. Hitting any key reads in the super strings. As each string is read in, you see a message stating that the save is good or the process stops and you are asked to rewind the tape. You are given a choice of either resaving the data or adjusting the volume for another try at verifying.

When the save is satisfactory, the super strings will once again be displayed and broken down for your viewing. Now power down the entire system to ensure that no data at all remains in the computer.

Program Listing 2

Type in Program Listing 2. The only data you are required to enter is to reserve space for strings by entering the number of entries and their lengths. As each super string is loaded it is displayed and then broken down.

Now put the routines into use in your programs. You don't have to retype the data either. Build a quick routine to read in your old data and add the blanks to equal out their length. While these routines are based on the TRS-80 Model I Level II, they should work with a few changes on any system.

Further Suggestions

One further idea to reduce the amount of memory required would be to destroy the super strings as they are broken down, and destroy the individual entries as they are built into super strings. This would involve a very minimal overlap, only the length of one super string.

If you want to play around with the concept of automatic reservation of space, try the routine in Program Listing 3. This could be quite useful if you have limited memory and want to see exactly what you can

```
Comparison of Save Times
Time Start Super String Save  = 00:00
Time End Super String Save #  1 = 00:09
Time End Super String Save #  2 = 00:17
Time End Super String Save #  3 = 00:26
Saving Space
Time End Super String Save # 10 = 01:25
Time End Super String Save # 11 = 01:34
Time End Super String Save # 12 = 01:42
Elapsed Time = 1 Minute 42 Seconds

Time Start Number Save: = 00:00
Time End Data Save #    1 232156 @ 00:08
Time End Data Save #    2 469059 @ 00:13
Time End Data Save #    3 826096 @ 00:17
Saving Space
Time End Data Save # 498 733678 @ 36:29
Time End Data Save # 499 961027 @ 36:33
Time End Data Save # 500 320628 @ 36:38
Elapsed Time = 36 Minutes, 38 Seconds
```

Table 1

```
100 CLEAR 20000
110 DIM A (500), B$ (25)
120 DEFINT J, D
130 CLS
140 PRINT @ 192,"WHAT IS THE LENGTH OF THE DATA STATEMENTS ";:IN
PUT I
150 J = 249/I
160 PRINT @ 192, STRING$ (63," ")
170 PRINT @ 210, "HOW MANY NUMBERS WILL BE INPUT "; : INPUT A
180 DIM A$(A), D$(A), X(A)
190 PRINT @ 192, STRING$ (63," ")
200 D = A/J
210 FOR X = 1 TO D + 1
220 INPUT @ - 1 , B$(X)
230 NEXT X
240 C = 1
250 Y = 1
260 FOR X = 1 TO A
270 D$(X) = MID$(B$(C),Y,I)
280 IF D$(X) = "" THEN X = A
290 PRINT X ; " " ; D$(X) ;
300 Y = Y + I
310 IF X/J = INT (X/J) THEN C = C + 1 : Y = 1
320 NEXT X
```

Program Listing 2

```
100 CLS : CLEAR 1000 : DEFINT C, D, E, F
110 PRINT @ 200, "HOW MANY ENTRIES DO YOU HAVE "; : INPUT A
120 PRINT @ 200, "WHAT IS THE LENGTH OF EACH ONE "; : INPUT B
130 PRINT @ 210, STRING$(63," ")
140 PRINT @ 0, MEM + 1000
150 C = B * A + 500
160 D = 249/B
170 E=A/D
180 PRINT @ 200, "YOU REQUIRE";E;"SUPER STRINGS"
190 F = E * 8.5
200 PRINT @ 328, "AT 8.5 SECOND EACH, THIS WILL TAKE";F;"SEC.
210 G = A * 4.5
220 PRINT @ 455, "THE OLD WAY THIS WOULD TAKE";G;"SEC. OR"
230 H = G / 60
240 PRINT @ 519, H;"MINUTES"
250 PRINT @ 583, "YOU MUST RESERVE";C;"BYTES"
260 CLEAR (C)
270 PRINT @ 25, MEM
```

Program Listing 3

store within the confines of your available RAM. The only shortcoming of this routine is that when using it within a program, you must enter the length and number twice, because once the Clear command is executed, all variables are reset, so you must redimension and define. ■

```
100 CLS
110 FOR B = 1 TO 6
120 A = 671
130 PRINT @ 654, "ENTER NAME # ";B;"  ";STRING$(15,".")
140 FOR X = 1 TO 15
150 I$ = INKEY$ : IF I$ = "" GOTO 150
160 IF ASC(I$) = 101 AND X > 1 THEN A$(B) = LEFT$(A$(B),X-2) : X
 = X - 1 : I$ = "" : A = A - 1 : PRINT @ A + 1, "." : GOTO 150
170 IF ASC(I$) =13 THEN I$ = STRING$(16-X," "): X = 15
180 PRINT @ A+1,I$
190 A$(B) = A$(B) + I$ : A = A + 1
200 NEXT X
210 NEXT B
220 FOR X = 1 TO B : PRINT A$(X) : NEXT X
```

Program Listing 4

```
100 CLS
110 FOR B = 1 TO 6
120 A = 671
130 PRINT @ 654, "ENTER NUMBER ";B;"  ";STRING$(6,".")
140 FOR X = 1 TO 6
150 I$ = INKEY$ : IF I$ = "" GOTO 150
160 IF ASC(I$) = 101 AND X > 1 THEN A$(B) = LEFT$(A$(B),X-2) : X
 = X - 1 : I$ = "" : A = A - 1 : PRINT @ A + 1, "." : GOTO 150
170 IF ASC(I$) <48 OR ASC(I$) >57 THEN I$="" : GOTO 150
180 PRINT @ A+1,I$
190 A$(B) = A$(B) + I$ : A = A + 1
200 NEXT X
210 NEXT B
220 FOR X = 1 TO B : PRINT A$(X); : NEXT X
```

Program Listing 5

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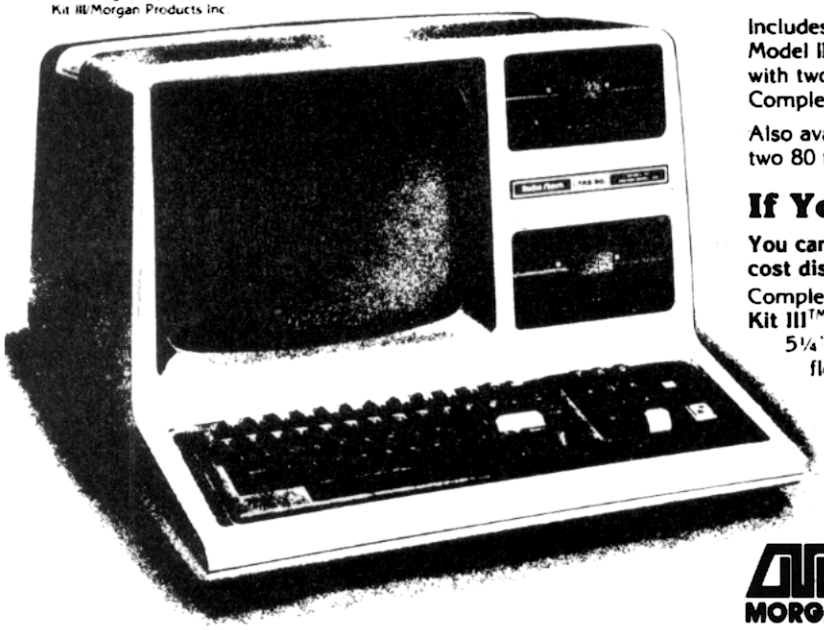

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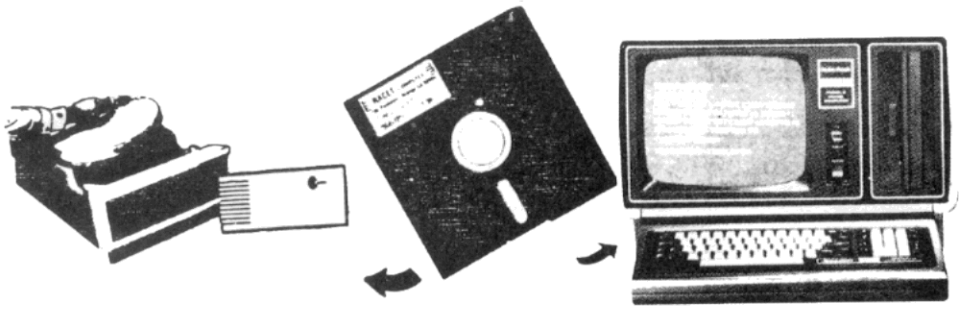

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The Key Box

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There is a section in the Level I user's manual titled "And it Draws Pictures, Too." Oh boy! This is what I had been waiting for.

I eagerly typed in the program, pressed Enter, and watched my TRS-80 give me Tandy's version of a circle. Not only was it lumpy—it was an oval, not a circle! Upgrading to Level II and then to DOS still gave me lumpy ovals. How could Tandy do this to me? I don't think anyone would argue if I said that 48 by 128 pixels just won't cut it.

The only answer seemed to be an XY plotter, but those cost real money. I decided to build my own. Since I don't have a metal shop, I built it out of wood. Don't laugh—it works, and cost less than $40!

Design

When I started to think at the nuts and bolts level about what a plotter must be able to do, I found it really wasn't all that complicated. I needed a fine felt tipped pen and a means of moving the pen a known and repeatable distance on the X and Y axes, under computer control. Also, the number of plottable points should be large compared to the number on the TRS-80 screen.

The tools needed to build the plotter are a table or radial arm saw, a drill press or hand power drill and lots of sandpaper.

There are four parts that must fit each other exactly, and that's where the sandpaper comes in. If the parts are too loose, the pen will wiggle as it moves and if the parts are too tight, the pen won't move at all because the motors can't overcome the friction.

I have found the Pilot Razor Point pen to work best, mainly because of its fine tip. This pen fits into a holder made of ⅝inch dowel drilled lengthwise to hold the pen firmly. The pen should have very little sideways movement relative to the holder, yet be easy to insert and remove. The pen holder is held in the pen carriage with a 6-32 setscrew; this allows the height of the pen above the platen to be set exactly.

The pen carriage contains the pen holder, holds the nut that rides on the lead screw and it slides along the Y axis arm. The Y axis nut is held to the pen carriage by two pieces of slotted wood glued to the carriage. Riding in these two slots is a piece of wood drilled to allow the nut to be pressed into it. This piece should be able to move up and down.

The pen carriage and the Y axis arm are two parts that must have a close fit and still slide easily. I found it easiest to cut the slot in the pen carriage first, then cut the Y axis arm slightly oversized and sand the arm to fit the slot.

I used a rectangular cross-section for the Y arm to prevent the pen carriage from rotating around the Y arm. Riding next to the Y arm is another rectangular piece with its wide axis at 90 degrees to the Y arm; this helps strengthen the design. On the upper end of the Y arm is a small block containing a bearing.

The bearing rides on the platen and supports the end of the Y arm. At the other end of the Y arm is the Y axis motor support. This support holds the Y axis motor and the X axis lead screw nut. Under the Y axis motor support is the X axis guide. This guide should be as long as possible to reduce wobble and keep the X and Y axes at 90 degrees to each other.

The guide rests on a piece of wood (¼ x ¾ inch) glued to the platen. This piece of wood and the guide are the last two pieces that must have a good fit. I made the guide by, again, cutting the slot first and then

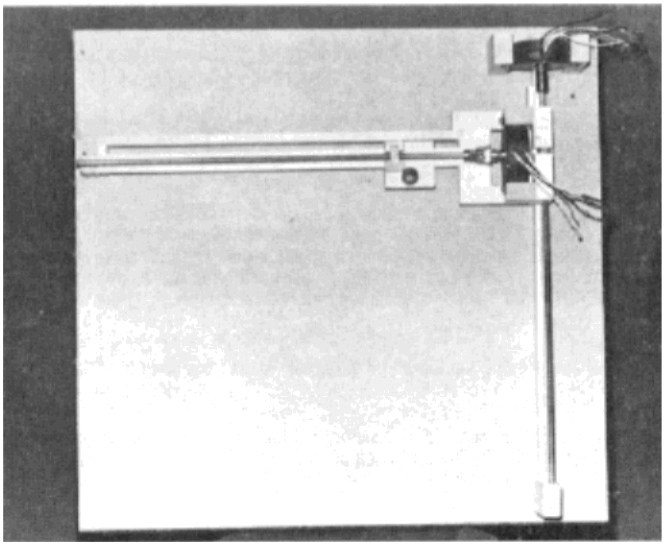

Photo 1. Top View of Plotter

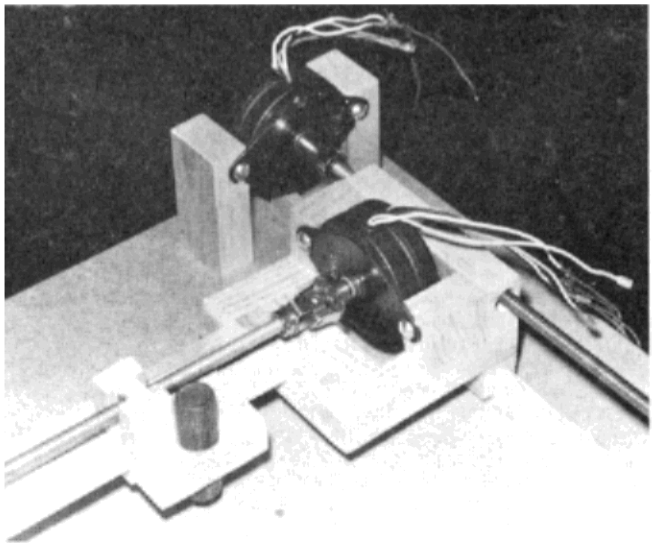

Photo 2. Close-up

"The hardest part of the project was transferring power from motors to pen."

sanding the other piece to fit.

The guide bears the weight of the Y axis motor support. A ½ inch hole is drilled through the back piece of the Y axis motor support, and a slot is then cut at the center of this piece at right angles to the hole. The cut should be made to allow the X axis nut to be pressed into it. The X axis screw will then fit through the hole touching only the nut. The X axis motor is held by two pieces of wood screwed to the platen.

Other than the pen holder set screw, the X axis motor support, Y axis arm bearing support and the screws that hold the motors, everything is held together with white glue. I have found it best to leave the sliding parts raw wood. Do not use wax—wax is a better glue than lubricant.

Transferring Power

The hardest part of this project was transferring power from motors to pen. Two methods come to mind: a pulley and string system or lead screw and nut.

First I tried the pulley and string method, because it would make a faster plotter, but I ran into too many problems. I could only get 40 steps to the inch with the pulley and string, which I felt was not good enough. Since the motors turn in sharp steps, the Y axis arm had a tendency to oscillate.

The lead screw and nut have worked better than I hoped. By using a ¼-20 threaded rod as a lead screw, I get 960 steps to the inch, and the motor now jerks in the wrong direction to make the Y arm oscillate. However I *have* discovered the one major rule of lead screws: Unless the lead screw is *perfectly* straight, do not hold it rigidly in more than one place. (I can guarantee the threaded rod from the hardware store will not be straight.) Hold it rigidly only on the nut that rides on the screw.

The end of the lead screw opposite the motor will not be held at all; the block of wood at the far end of the X axis has a ½ inch hole for the lead screw and the screw never touches the wood. This block is there to keep the X axis screw from moving very far if the plotter is tilted on its side.

The motor end uses a flexible coupling. You can use a small universal joint or make a coupling from potentiometer shaft couplers. Drill out half the coupler as large as possible, center the end of the lead screw in this hole and fill in around it with rubber bathtub caulking. The lead screws should not support any weight; they are only used to pull and push.

The Electrical Connection

I used Computer Devices Corp. model 23RS-1E motors. They can be obtained from American Design Components, 39 Lispenard St., New York, NY 10013, at $14.50 each plus postage. The motors are rated at 28VDC with a stepping angle of 7.5

	Bit	Wire
Y Motor	0	Black B
	1	White A
	2	White B
	3	Black A
X Motor	4	Black A
	5	White B
	6	White A
	7	Black B

Table 1. Wire Connections

(Z)ero	Sets the X and Y counters to zero, and is used to set the origin of the graph.
(D)igitize	Writes the contents of the X and Y counters to the disk.
(P)en	Writes the contents of the XY counters to disk, also writes two dummy variables (.5, .5) to disk. This is used to indicate the end of a line. When Draw encounters the dummy variables, it will display the Remove Pen message, then move to the next set of coordinates and wait for the pen to be inserted.
Up Arrow	Move the pen holder up at about one step per second.
Down Arrow	Move the pen holder down at one step/sec
Right Arrow	Move the pen holder right at one step/sec
Left Arrow	Move the pen holder left at one step/sec
(F)ast	When pressed at the same time as the arrow keys, the pen holder will move ten times as fast.
(E)nd	End the program.

Table 2. Digitz Commands

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The X and Y motor wiring is not the same, because I have defined right and up as positive, and left and down as negative. To move the pen to the lower left (both negative directions), the X motor must push the pen away and the Y motor must pull the pen toward itself. The motors turn in opposite directions when both are going positive or both going negative.

Almost any transistor will do as long as it can handle 150mA.

Though the motors are rated at 28VDC, I find mine work best at 20VDC. The faster a stepping motor is stepped, the smaller is the delivered torque, until the motor starts to miss steps. The dropping torque curve will, therefore, define an upper speed for the plotter depending on friction. I can step my motor at 83 steps per second; with 48 steps per revolution and a 20 turn to the inch lead screw, this works out to .08 inches per second pen speed.

I never claimed this plotter was fast—only cheap.

Teaching It Manners

This plotter is dumb; it must be told how and when to do everything.

I wrote five programs to drive the plotter, one in machine language and four in Basic. The machine language program talks to the plotter; the Basic programs drive the machine language program.

The machine language program, Hiplot, (Program Listing 1) talks to the plotter through one byte divided into two four-bit nybbles; each nybble controls one motor. Hiplot remembers the last coil energized in each motor and then bit shifts left or right depending on which way the motor is to turn. After each shift, the program checks if the bit has been shifted out of the nybble; if so, the bit is removed and the nybble is reinitialized by setting one of the end bits. Which end bit is used is determined by the direction the motor is to go. Hiplot then outputs to the port. Finally, Hiplot resets all output bits to limit current draw.

"This plotter is dumb; it must be told how and when to do everything."

Before it can do anything, Hiplot needs to be told which way to move the pen and how many steps to go in that direction. Directions are given by POKEing a number from one to four into memory location &HBDFE: 1 = up 2 = right 3 = down 4 = left. The number of steps is supplied as an argument in the USR call. To make the plotter go left 5000 steps, POKE location &HBDFE with a 4, and a USR call of DUMMY = USR 1(5000). Near the end of Hiplot is the label Delay. This is the delay between bit shifts, and controls the motor speed by counting down the number in register BC. The count of 200 hex is used with my plotter; this will change from plotter to plotter depending on the amount of friction that exists.

Lineplot (Program Listing 2) is the Basic subroutine that drives Hiplot. Lineplot draws straight lines between two points, and keeps track of the current location of the pen, in rectangular coordinates. It is given the XY coordinates of the location the pen is to go to. Lineplot then calculates the combination of X and Y steps that will draw the straightest line between the two points. The current pen

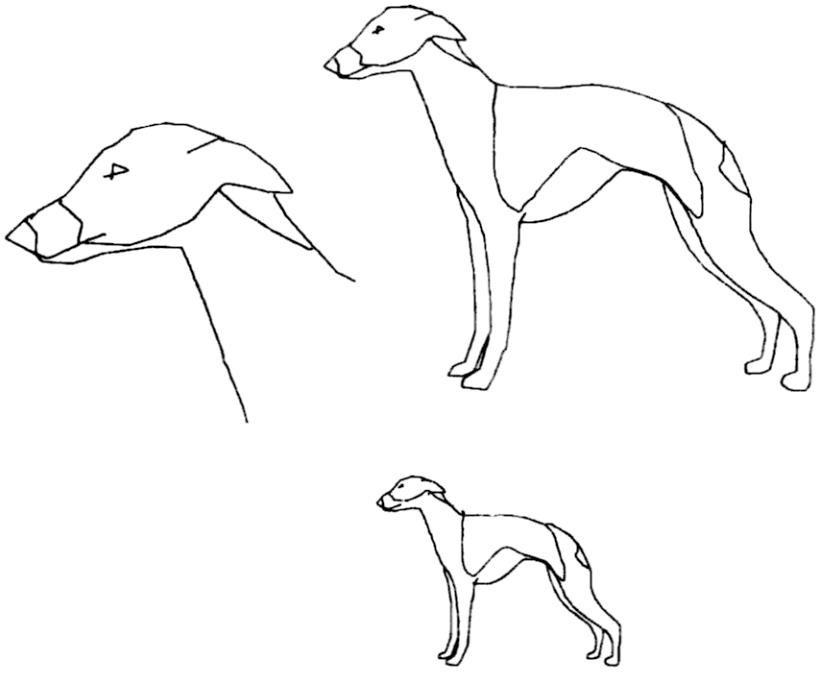

Fig. 1. Dogs

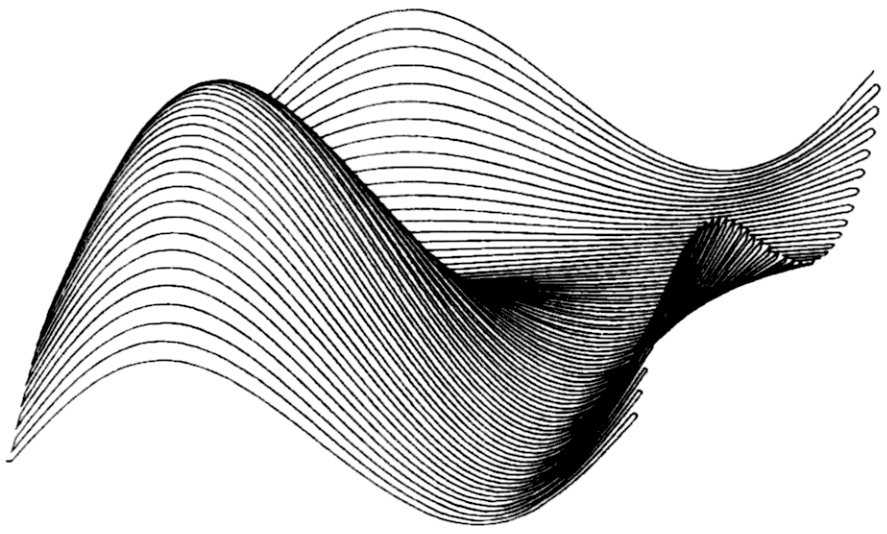

Fig. 2.

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"To use the program, place what you wish to digitize on the platen."

location can at any time be changed by changing LX and LY to the coordinates desired.

Program Listings 3 and 4, Digitz and Draw, are used as a pair. Digitz digitizes a graph and writes it to disk. It understands nine commands which are listed in Table 2. Draw then reads the disk and reproduces the graph.

To use the program, place what you wish to digitize on the platen. While sighting down through the empty pen holder, use the F command and the Arrow keys to move to the starting point. Press Z to zero the counters. Now move along the line to be digitized, pressing D at each point you wish to digitize. At the last point on the line, press P. Move to the start of the next line, press D and continue until all lines have been digitized. When done, press E.

Draw reads the file written by Digitz and

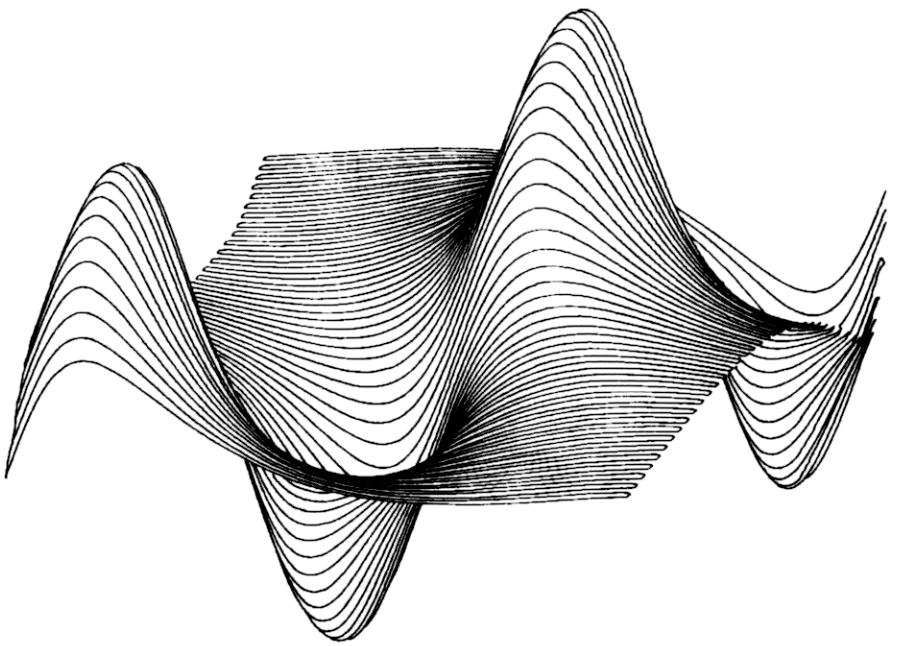

Fig. 3.

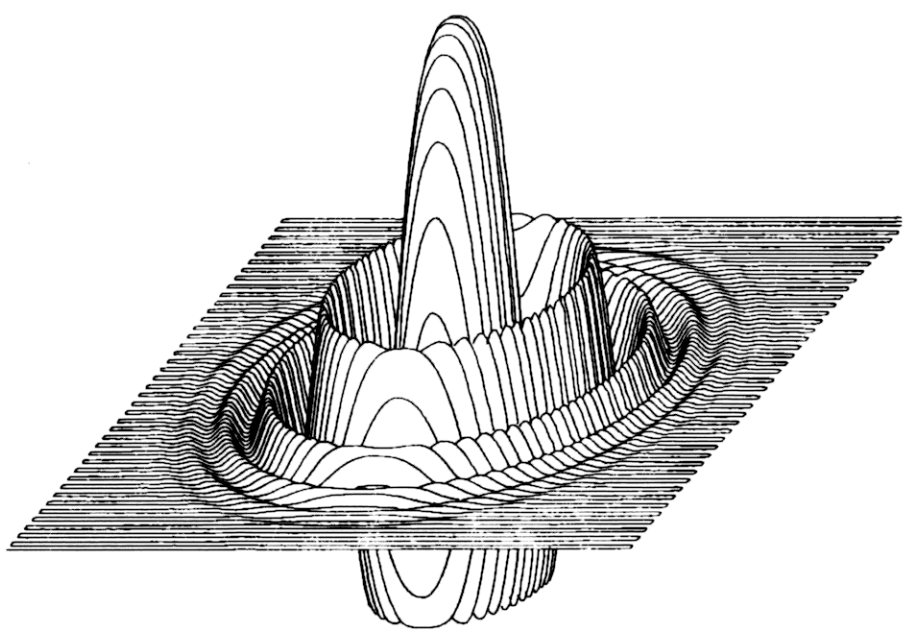

Fig. 4.

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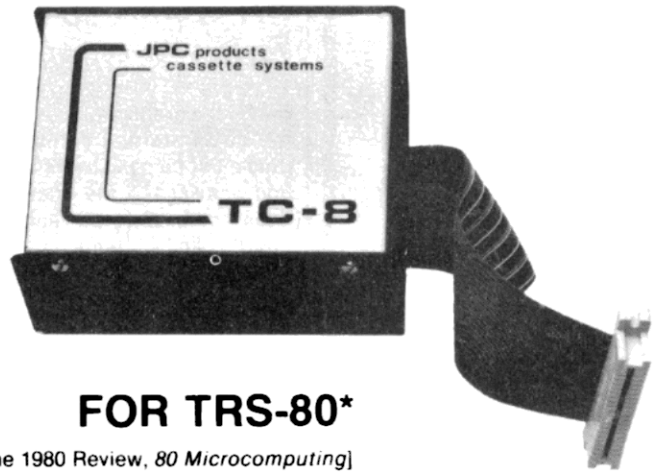

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by Carl A. Kollar

[Reprint of June 1980 Review, *80 Microcomputing*]

I guess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 250 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of *Microcomputing* had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute cassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly [90] bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronics, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ × 11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subjects is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Commands and Features

SAVE"filename": Saves your BASIC program on cassette.
LOAD: Reads the next BASIC program from the cassette.
LOAD"filename": Searches for and loads the specified file from cassette.
LOAD? and LOAD?"filename": Reads file from cassette, and compares contents to memory.
LOADN: Prints a list of all the programs on a cassette, until interrupted by the "break" key.
LOADN"filename": Same as above except the tape will stop at the end of the program named.
KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.
RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.
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GET: Same as LOAD, except it is for use with system tapes.
GET"filename": Same as LOAD "filename", except it is for use with system tapes.
GET? and GET?"filename": Same as LOAD? and LOAD?"filename", except it is for use with system tapes.
GETN and GETN"filename": Same as LOADN and LOADN"filename", except it is for use with system tapes.
OPEN: Required before cassette input or output of a data file can be attempted.
CLOSE: Required to end a cassette data file.
PRINT#: Allows numerical or string data to be output to a cassette file.
INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the "one load in a million bytes" claim, but my son, Anthony (age 11), loaded about 30 of his programs from his Radio Shack format tape to a new TC-8 format tape. He's run them all and found no bad loads.

Unlike the standard tape system, you can position your tape anywhere before the program you want and not have to look for a blank spot between programs. The TC-8 patiently waits for the program you want and then starts loading without getting confused by the portion of the previous program you just fed it.

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"This will cause Draw to draw the graph larger or smaller than the original."

draws the graph digitized. Move the pen to the same starting point used to digitize (this must be done by hand), insert the pen and answer the file question. The graph does not have to be reproduced exactly. Line 60 can be changed by inserting a constant to divide or multiply by. This will cause Draw to draw the graph larger or smaller than the original. The pictures of the dog were done this way (Figure 1). The dog on the upper right is the original size. The dog on the lower right was done by inserting 'X = X/2, Y = Y/2' at the start of line 60 and the left dog by inserting 'X = X by 2, Y = Y by 2'.

Program Listing 5, Sinplot, is a sample of how to write a program for the plotter using Lineplot. Sinplot draws a sine wave with axes. The pen should be positioned at the middle left of the paper. Lines 10-20 plot the sine wave; Y is the sine of the angle Z with the scaling factor (3300) added; X is stepped 25 counts for each degree. Lines 30-50 draw the X axis with tic marks. Each tic is 240 steps high, and since the tic marks are 45 degrees apart, there are 1125 (45 by 25) counts between them. After the X axis is drawn, the pen is back at the origin. To draw the Y axis, in lines 60-70 the pen must be moved to the top of the paper. To avoid drawing two lines, I ask that the pen be removed. The pen is now moved up 3300 counts and again inserted. Lines 80-100 draw the Y axis with tic marks. The Y tics are 120 counts wide. As I want four tics, they are

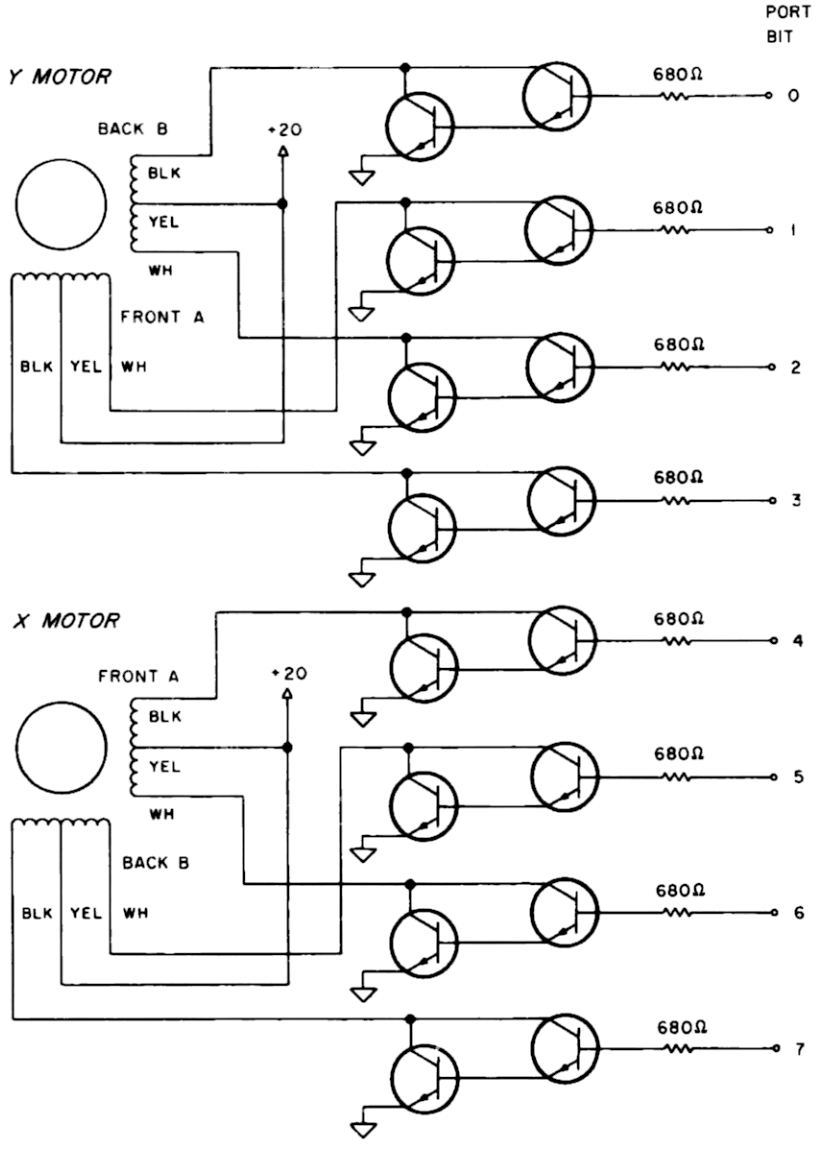

Fig. 5.

"My plotter has an 11 by 11 inch platen giving about 1.1×10^8 plottable points, which is darn good."

1650 counts apart (total Y axis length, 6600 divided by the number of tic marks). Line 110 draws the final Y axis tic and line 120 ends the program. The rest of the program is the subroutine Lineplot.

To find the scaling factors, all that must be remembered is that there are 960 steps per inch. Therefore, if you wish a plot to be 7 inches in Y and 10 inches in X, the number of steps would be 6720 (960*7) in Y and 9600 (960*10) in X.

This plotter is not the easiest to use—having to turn the lead screws by hand can be a pain—but all in all it isn't bad for the time and money invested. If built with care, the plotter can turn out high quality plots (See Figures 2, 3 and 4). My plotter has an 11 by 11 inch platen giving about 1.1E8 plottable points, which is darn good. There is nothing magic about the dimensions given. They are only one way to go. ■

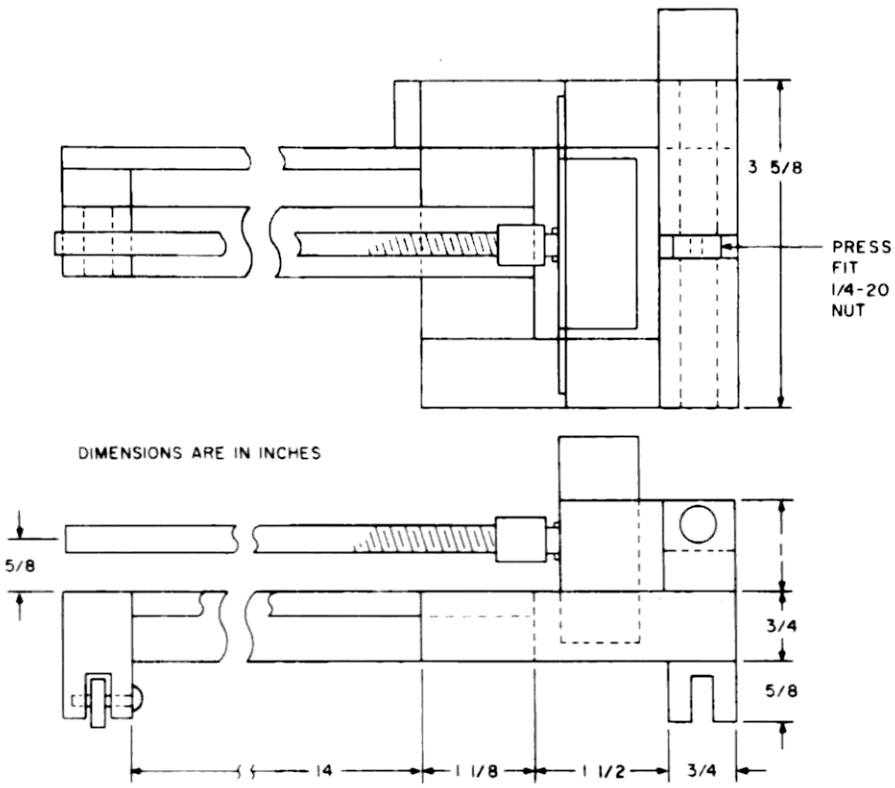

Fig. 6.

Program Listing 1. Hiplot

```
                00110 ; LOC. <BDFF-48639> MUST BE ZEROED BEFORE FIRST USR CALL
                00120 ; LOC. <BDFE-48638> IS THE DIR REG
                00130 ; 1=UP    2=RIGHT  3=DOWN  4=LEFT
                00140 ; LO NIBBLE=Y    HI NIBBLE=X
                00150 ; USE INTERFACE PORT #2
                00160 ;
                00170 ;
BE00            00180          ORG     0BE00H
BE00 CD7F0A     00190          CALL    0A7FH    ;GET DIR. & NUM. OF STEPS
BE03 3AFEBD     00200          LD      A,(0BDFEH)
BE06 FE01       00210          CP      01       ;DIR 1?
BE08 285E       00220          JR      Z,DIR1
BE0A FE02       00230          CP      02H      ;DIR 2?
BE0C 283E       00240          JR      Z,DIR2
BE0E FE03       00250          CP      03H      ;DIR 3?
BE10 281E       00260          JR      Z,DIR3
                00270 ;
                00280 ;        GO LEFT
                00290 ;
BE12 3AFFBD     00300          LD      A,(0BDFFH) ;GET X,Y COUNT
BE15 E6F0       00310 DIR41    AND     0F0H      ;MASK OUT Y
BE17 CB3F       00320          SRL     A         ;SHIFT RIGHT
```

Program Listing 1 continues

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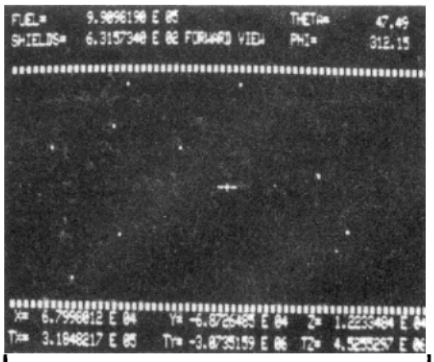

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Program Listing 1 continued

```
BE19 E6F0     00330          AND     0F0H
BE1B FE00     00340          CP      00
BE1D 2002     00350          JR      NZ,OK4   ;REINIT. JP IF NO
BE1F 3E80     00360          LD      A,80H
BE21 D302     00370 OK4      OUT     (2),A    ;OUTPUT BYTE
BE23 CD9EBE   00380          CALL    DELAY
BE26 CDA9BE   00390          CALL    COUNT
BE29 20EA     00400          JR      NZ,DIR41 ;JP IF NOT DONE
BE2B CD93BE   00410          CALL    RESRHI
BE2E 1854     00420          JR      END
              00430 ;
              00440 ;        GO DOWN
              00450 ;
BE30 3AFFBD   00460 DIR3     LD      A,(0BDFFH)  ;GET X,Y COUNT
BE33 E60F     00470 DIR31    AND     0FH      ;MASK OUT X
BE35 CB3F     00480          SRL     A        ;SHIFT RIGHT
BE37 FE00     00490          CP      00
BE39 2002     00500          JR      NZ,OK3   ;REINIT. JP IF NO
BE3B 3E08     00510          LD      A,08
BE3D D302     00520 OK3      OUT     (2),A    ;OUTPUT BYTE
BE3F CD9EBE   00530          CALL    DELAY
BE42 CDA9BE   00540          CALL    COUNT
BE45 20EC     00550          JR      NZ,DIR31 ;JP IF NOT DONE
BE47 CD88BE   00560          CALL    RESRLO
BE4A 1838     00570          JR      END
              00580 ;
              00590 ;        GO RIGHT
              00600 ;
BE4C 3AFFBD   00610 DIR2     LD      A,(0BDFFH)  ;GET X,Y COUNT
BE4F E6F0     00620 DIR21    AND     0F0H     ;MASK OUT Y
BE51 CB27     00630          SLA     A        ;SHIFT LEFT
BE53 FE00     00640          CP      00
BE55 2002     00650          JR      NZ,OK2   ;REINT. JP IF NO
BE57 3E10     00660          LD      A,10H
BE59 D302     00670 OK2      OUT     (2),A    ;OUTPUT BYTE
BE5B CD9EBE   00680          CALL    DELAY
BE5E CDA9BE   00690          CALL    COUNT
BE61 20EC     00700          JR      NZ,DIR21 ;JP IF NOT DONE
BE63 CD93BE   00710          CALL    RESRHI
BE66 181C     00720          JR      END
              00730 ;
              00740 ;        GO UP
              00750 ;
BE68 3AFFBD   00760 DIR1     LD      A,(0BDFFH) ;GET X,Y COUNT
BE6B E60F     00770 DIR11    AND     0FH      ;MASK OUT X
BE6D CB27     00780          SLA     A        ;SHIFT LEFT
BE6F E60F     00790          AND     0FH
BE71 FE00     00800          CP      00
BE73 2002     00810          JR      NZ,OK1   ;REINIT. JP IF NO
BE75 3E01     00820          LD      A,01
BE77 D302     00830 OK1      OUT     (2),A    ;OUTPUT BYTE
BE79 CD9EBE   00840          CALL    DELAY
BE7C CDA9BE   00850          CALL    COUNT
BE7F 20EA     00860          JR      NZ,DIR11 ;JP IF NOT DONE
BE81 CD88BE   00870          CALL    RESRLO
BE84 AF       00880 END      XOR     A
BE85 D302     00890          OUT     (2),A
BE87 C9       00900          RET
              00910 ;
              00920 ;
BE88 47       00930 RESRLO   LD      B,A
BE89 3AFFBD   00940          LD      A,(0BDFFH)
BE8C E6F0     00950          AND     0F0H
BE8E B0       00960          OR      B
BE8F 32FFBD   00970          LD      (0BDFFH),A
BE92 C9       00980          RET
BE93 47       00990 RESRHI   LD      B,A
BE94 3AFFBD   01000          LD      A,(0BDFFH)
BE97 E60F     01010          AND     0FH
BE99 B0       01020          OR      B
BE9A 32FFBD   01030          LD      (0BDFFH),A
BE9D C9       01040          RET
BE9E 57       01050 DELAY    LD      D,A
BE9F 010002   01060          LD      BC,0200H
BEA2 0B       01070 AGAIN    DEC     BC
BEA3 78       01080          LD      A,B
BEA4 B1       01090          OR      C
BEA5 20FB     01100          JR      NZ,AGAIN
BEA7 7A       01110          LD      A,D
BEA8 C9       01120          RET
BEA9 57       01130 COUNT    LD      D,A
BEAA 2B       01140          DEC     HL
BEAB 7C       01150          LD      A,H
BEAC B5       01160          OR      L
BEAD 7A       01170          LD      A,D
BEAE C9       01180          RET
0000          01190          END
```

Program Listing 2. Lineplot

```
1 DEFUSR 1=(&HBE00) :POKE(&HBDFF),0 :HF=.5 :X5=1
5 INPUT "FILE NAME";F$ : F$=F$+"/TXT"
10 FLG=0 : CLS
20 OPEN"I",1,F$
30 IF EOF(1) THEN CLOSE : END : PRINT "DONE"
40 INPUT #1,X,Y : PRINT X,Y
```

Program Listing 2 continues

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Program Listing 2 continued

```
50 IF X=.5 AND Y=.5 PRINT "REMOVE PEN PRESS ENTER, WHEN PLOTTER
STOPS, INSERT PEN PRESS    ENTER" : INPUT A$ : FLG=1 : GOTO 30
60 GOSUB 1000 : IF FLG=1 THEN FLG=0 : INPUT A$
70 GOTO 30
990 END
1000 IF INT(X-LX)=0 THEN 1170
1010 IF INT(Y-LY)=0 THEN 1190
1020 IF ABS(Y-LY)>ABS(X-LX) THEN 1100
1030 JOG=ABS(Y-LY)/ABS(X-LX) : JC=0
1040 IF X>LX THEN X1=2 ELSE X1=4
1050 IF Y>LY THEN X2=1 ELSE X2=3
1060 FOR X4=1 TO ABS(X-LX)
1070 POKE(&HBDFE),X1 : X3=USR 1(1) : JC=JC+JOG
1080 IF JC>=HF THEN JC=JC-X5 : POKE(&HBDFE),X2 : X3=USR 1(1)
1090 NEXT : LX=X : LY=Y : RETURN
1100 JOG=ABS(X-LX)/ABS(Y-LY) : JC=0
1110 IF Y>LY THEN X1=1 ELSE X1=3
1120 IF X>LX THEN X2=2 ELSE X2=4
1130 FOR X4=1 TO ABS(Y-LY)
1140 POKE(&HBDFE),X1 : X3=USR 1(1) : JC=JC+JOG
1150 IF JC>=HF THEN JC=JC-X5 : POKE(&HBDFE),X2 : X3=USR 1(1)
1160 NEXT : LY=Y : LX=X : RETURN
1170 IF Y>LY THEN POKE(&HBDFE),1 ELSE POKE(&HBDFE),3
1180 IF Y-LY=0 RETURN ELSE X3=USR 1(ABS(Y-LY)) : LY=Y : RETURN
1190 IF X>LX THEN POKE(&HBDFE),2 ELSE POKE(&HBDFE),4
1200 IF X-LX=0 RETURN ELSE X3=USR 1(ABS(X-LX)) : LX=X : RETURN
```

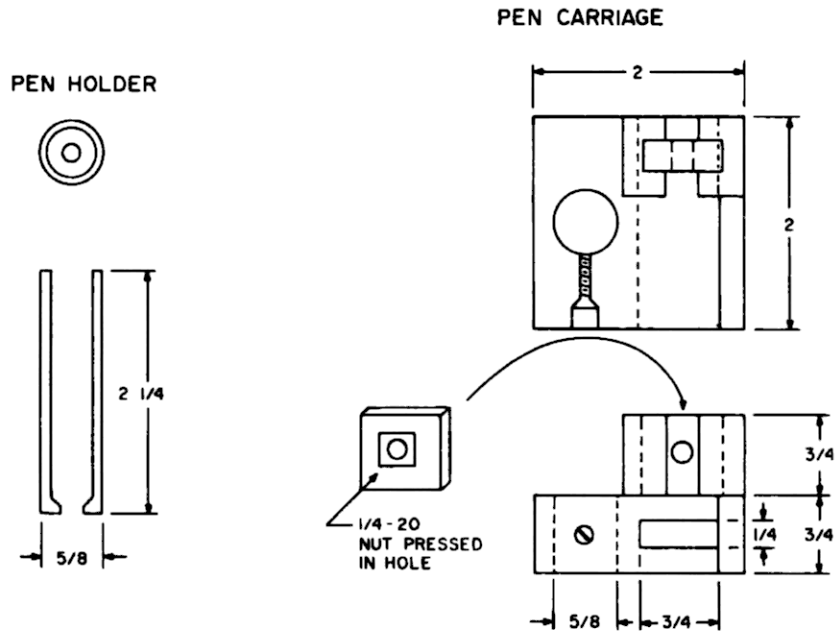

Fig. 7.

Program Listing 3. Digitz

```
1 INPUT "FILE NAME";F$ : F$=F$+"/TXT"
5 CLS : OPEN "O",1,F$
10 DEFUSR 1=(&HBE00) : POKE(&HBDFF),0
20 P=PEEK(&H3840)
25 IF PEEK(&H3801)=64 THEN S=10 ELSE S=1
30 IF P=8 THEN 100
40 IF P=16 THEN 120
50 IF P=32 THEN 140
60 IF P=64 THEN 160
62 A$=INKEY$
64 IF A$="D" THEN PRINT #1,X;Y
66 IF A$="E" THEN CLOSE : END
68 IF A$="P" THEN PRINT #1,X;Y;.5;.5
70 P=PEEK(&H3800)
80 IF P<>4 THEN 90
82 X=0 : Y=0 : PRINT@ 0,"X=";X;"      ";
```

Program Listing 3 continues

Program Listing 3 Continued

```
      84 PRINT@ 30,"Y=";Y;"       ";
      90 GOTO 20
     100 POKE(&HBDFE),1 : Y=Y+S : PRINT@ 32,Y;"       ";
     110 Z=USR 1(S) : GOTO 20
     120 POKE(&HBDFE),3 : Y=Y-S : PRINT@ 32,Y;"       ";
     130 Z=USR 1(S) : GOTO 20
     140 POKE(&HBDFE),4 : X=X-S : PRINT@ 2,X;"       ";
     150 Z=USR 1(S) : GOTO 20
     160 POKE(&HBDFE),2 : X=X+S : PRINT@ 2,X;"       ";
     170 Z=USR 1(S) : GOTO 20
```

Program Listing 4. Draw

```
1 DEFUSR 1=(&HBE00) :POKE(&HBDFF),0 :DEFINT X,Y :HF=.5 :X5=1
990 END
1000 IF INT(X-LX)=0 THEN 1170
1010 IF INT(Y-LY)=0 THEN 1190
1020 IF ABS(Y-LY)>ABS(X-LX) THEN 1100
1030 JOG=ABS(Y-LY)/ABS(X-LX) : JC=0
1040 IF X>LX THEN X1=2 ELSE X1=4
1050 IF Y>LY THEN X2=1 ELSE X2=3
1060 FOR X4=1 TO ABS(X-LX)
1070 POKE(&HBDFE),X1 : X3=USR 1(1) : JC=JC+JOG
1080 IF JC>=HF THEN JC=JC-X5 : POKE(&HBDFE),X2 : X3=USR 1(1)
1090 NEXT : LX=X : LY=Y : RETURN
1100 JOG=ABS(X-LX)/ABS(Y-LY) : JC=0
1110 IF Y>LY THEN X1=1 ELSE X1=3
1120 IF X>LX THEN X2=2 ELSE X2=4
1130 FOR X4=1 TO ABS(Y-LY)
1140 POKE(&HBDFE),X1 : X3=USR 1(1) : JC=JC+JOG
1150 IF JC>=HF THEN JC=JC-X5 : POKE(&HBDFE),X2 : X3=USR 1(1)
1160 NEXT : LY=Y : LX=X : RETURN
1170 IF Y>LY THEN POKE(&HBDFE),1 ELSE POKE(&HBDFE),3
1180 IF Y-LY=0 RETURN ELSE X3=USR 1(ABS(Y-LY)) : LY=Y : RETURN
1190 IF X>LX THEN POKE(&HBDFE),2 ELSE POKE(&HBDFE),4
1200 IF X-LX=0 RETURN ELSE X3=USR 1(ABS(X-LX)) : LX=X : RETURN
```

Program Listing 5. Sinplot

```
1 DEFUSR 1=(&HBE00) :POKE(&HBDFF),0 :DEFINT X,Y :HF=.5 :X5=1
10 FOR Z=0 TO 360 : Y=SIN(Z*.0174533)*3300 : X=Z*25
20 GOSUB 1000 : NEXT
30 FOR Z=1 TO 8 : Y=Y+120 : GOSUB 1000 : Y=Y-240 : GOSUB 1000
40 Y=Y+120 : GOSUB 1000 : X=X-1125 : GOSUB 1000
50 NEXT
60 INPUT "REMOVE PEN, PRESS ENTER";A$
70 Y=Y+3300 : GOSUB 1000
80 INPUT "INSERT PEN, PRESS ENTER";A$
90 FOR Z=1 TO 4 : X=X+120 : GOSUB 1000 : X=X-120 : GOSUB 1000
100 Y=Y-1650 : GOSUB 1000 : NEXT
110 X=X+120 : GOSUB 1000 : X=X-120 : GOSUB 1000
120 INPUT "REMOVE PEN, PRESS ENTER";A$ : END
990 END
1000 IF INT(X-LX)=0 THEN 1170
1010 IF INT(Y-LY)=0 THEN 1190
1020 IF ABS(Y-LY)>ABS(X-LX) THEN 1100
1030 JOG=ABS(Y-LY)/ABS(X-LX) : JC=0
1040 IF X>LX THEN X1=2 ELSE X1=4
1050 IF Y>LY THEN X2=1 ELSE X2=3
1060 FOR X4=1 TO ABS(X-LX)
1070 POKE(&HBDFE),X1 : X3=USR 1(1) : JC=JC+JOG
1080 IF JC>=HF THEN JC=JC-X5 : POKE(&HBDFE),X2 : X3=USR 1(1)
1090 NEXT : LX=X : LY=Y : RETURN
1100 JOG=ABS(X-LX)/ABS(Y-LY) : JC=0
1110 IF Y>LY THEN X1=1 ELSE X1=3
1120 IF X>LX THEN X2=2 ELSE X2=4
1130 FOR X4=1 TO ABS(Y-LY)
1140 POKE(&HBDFE),X1 : X3=USR 1(1) : JC=JC+JOG
1150 IF JC>=HF THEN JC=JC-X5 : POKE(&HBDFE),X2 : X3=USR 1(1)
1160 NEXT : LY=Y : LX=X : RETURN
1170 IF Y>LY THEN POKE(&HBDFE),1 ELSE POKE(&HBDFE),3
1180 IF Y-LY=0 RETURN ELSE X3=USR 1(ABS(Y-LY)) : LY=Y : RETURN
1190 IF X>LX THEN POKE(&HBDFE),2 ELSE POKE(&HBDFE),4
1200 IF X-LX=0 RETURN ELSE X3=USR 1(ABS(X-LX)) : LX=X : RETURN
```


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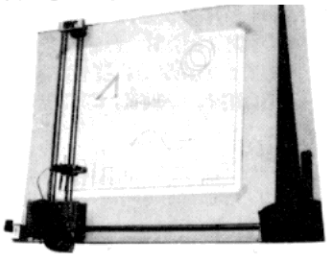

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I finally found a user-oriented data base management program that allows creation and management of an unlimited number of files. It also contains numerous prompts and error traps, and does not require extensive training to use. The eight different commands, shown in Table 1, have to be entered as numbers when the user is asked to input a command.

I constantly had to check the command list each time I selected a new command. This significantly increased the overall execution time; also left me frustrated because I could not remember the commands each number represented.

Using numbers to represent a command or option is not always poor programming practice. For example, selecting a number to determine the difficulty level of a game poses no problem to the user. However, using numbers to represent commands or options should be avoided if the user has a large list to choose from and may be using them frequently during the execution of a program. A data base management program is an excellent example of the type of program that should avoid using numbered options.

The Professional Way

Professional data-base management programs usually enter commands as words easily associated with the desired task (Print, Modify, Delete, etc.). Data-base management programs for microcomputers use numbers to represent options in most cases, however. Using words (strings) increases memory requirements and execution time; and the microcomputer for which the program is being written may not have the necessary string handling capabilities (for example, Level I Basic). However, I feel the main reason numbers are used is that numbers are easier for the programmer.

Program Listing 1 is a general outline of a data-base management program example. The program returns to the command selection/identification part of the code (beginning with line 10) after a particular command has been executed. This transfer to the nonexecutable Remark statement is done to simplify our discussion (GOTO statements would not usually be used to transfer control to nonexecutable statements).

Program Listing 2 shows the program statements needed to direct the sample program from one command to the next. The subroutine beginning at line 75 displays the command list each time a command selection is required. After using an If...Then statement to determine whether the command selection was 0 (for End), an On...GOTO statement is used to direct the program rather than additional If ...Then statements. The computer evaluates the numerical variable or expression in an On ...GOTO statement (in this case C) and then truncates it to an integer. It then counts to the appropriate element (INT(C)) in the line number list and continues to the specified line number.

For simplicity and clarity I have not included statements to trap potential user errors. For example, I have not considered that a number other than zero through seven might be entered as a command in Listing 2.

Alternatives

We will alter the program so commands are entered as the first word in their description (Print, Modify, Add, etc.). The commands should be easier to remember, we will choose not to automatically display them each time a selection is needed, but define an additional command, Help, which will display the list if it is needed for review. Program Listings 3 and 4 are two ways to do this. Using multiple If...Then statements (Listing 3) is the most straightforward approach; it requires about two and a half times as much memory as Listing 2, but the memory requirements (approximately 250 bytes) are minimal when compared to that required for an overall program of this type. I could not find a significant difference in execution time between Listing 2 and Listing 3. The GOTO statement in line 90 is needed in Listing 3 so the program will return to the command input statement (line 20) should the help command be used.

Program Listing 4 presents an alternative to Listing 3. The com-

Command Number	Description of Command
0	End Execution
1	Create a New File
2	Destroy (Delete) an Existing File
3	Print Contents of File
4	Search of File Entries by Keyword
5	Modify Entry in a File
6	Add Entry to a File
7	Remove (Delete) Entry from a File

Table 1. Example of a Command List

The Key Box

Level II Basic
Model I or III

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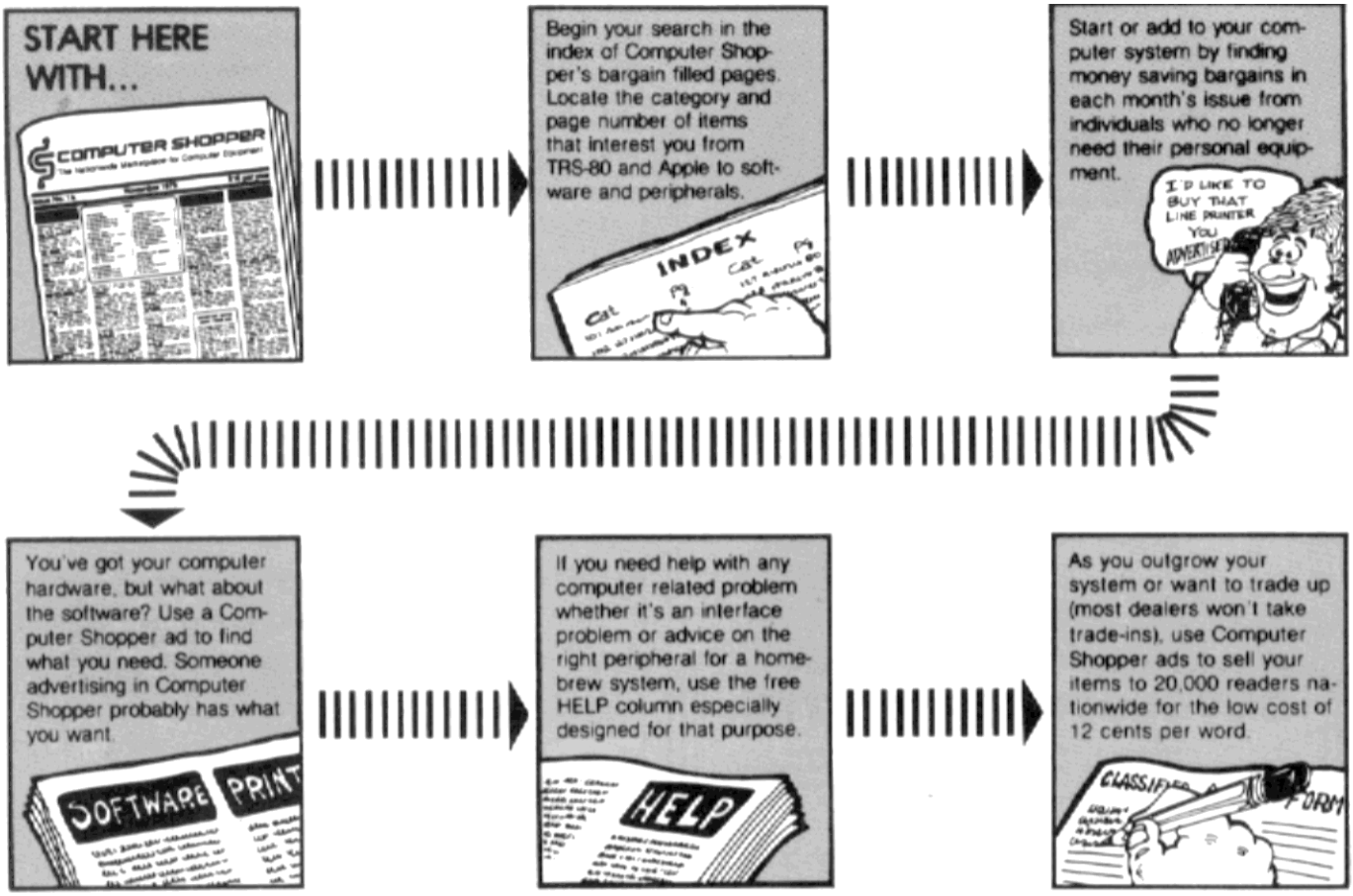

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mand list is defined as the string CL$ (line 30) which consists of only the first three letters of each command. After a command is entered, the computer takes the first three letters (line 25) and searches the command list CL$ to identify the command in terms of a number J, which is then used in the subsequent On . . . GOTO statement (line 60). The user may enter the complete word command or only the first three letters. On a Model III, execution time for this listing is somewhat longer than that for Listing 3, although in all cases it was less than 0.2 seconds.

The Time Factor

While using words rather than numbers generally makes it easier for the user to remember the commands, it also requires more user time during the input process. A compromise would require the user to input only the first letter of each command word (P for Print, M for Modify, and so on). The letters would be easier to remember than numbers and require only minimum input from the user. Use the same approach given in Listings 3 or 4 to alter your program to use letters.

I have presented simplified examples: each command used a different word and each word started with a different letter. This may not always be the case: in some programs, one word may be the best word to represent several commands. If we choose to represent commands by a letter several commands may have the same letter.

These problems are not insurmountable, but will require more thought on the programmer's part.■

```
 10 REM * COMMAND SELECTION/IDENTIFICATION *
     :
 99 END
100 REM * CREATE NEW FILE *
     :
190 GOTO 10
200 REM * DESTROY EXISTING FILE *
     :
290 GOTO 10
300 REM * PRINT CONTENTS OF FILE *
     :
390 GOTO 10
400 REM * KEYWORD SEARCH *
     :
490 GOTO 10
500 REM * MODIFY ENTRY *
     :
590 GOTO 10
600 REM * ADD ENTRY *
     :
690 GOTO 10
700 REM * REMOVE ENTRY *
     :
790 GOTO 10
```

Program Listing 1. Outline of the Data-Base Management Program Example

```
10 REM * COMMAND SELECTION/IDENTIFICATION *

15 GOSUB 75
20 INPUT "SELECT COMMAND"; C
25 IF C = 0 THEN 99
30 ON C GOTO 100, 200, 300, 400, 500, 600, 700

75 REM * DISPLAY COMMAND LIST AND DESCRIPTION *
     :
90 RETURN
```

Program Listing 2

```
10 REM * COMMAND SELECTION/IDENTIFICATION *

20 INPUT "SELECT COMMAND"; C$
25 IF C$ = "CREATE" THEN 100
30 IF C$ = "DESTROY" THEN 200
 :    :
 :    :
60 IF C$ = "END" THEN 99
65 IF C$ = "HELP" THEN 75

75 REM * DISPLAY COMMAND LIST AND DESCRIPTION *
 :
 :
90 GOTO 20
```

Program Listing 3

```
10 REM * COMMAND SELECTION/IDENTIFICATION *

20 INPUT "SELECT COMMAND"; C$
25 C$ = LEFT$ (C$, 3)
30 CL$ = "CREDESPRISEAMODADDREMENDHEL"
35 J = 0
40 FOR I = 1 TO LEN (CL$) STEP 3
45  = J + 1
50 IF C$ = MID$ (CL$, I, 3) THEN 60
55 NEXT I
60 ON J GOTO 100, 200, 300, 400, 500, 600, 700, 99, 75

75 REM * DISPLAY COMMAND LIST AND DESCRIPTION *
 :
 :
90 GOTO 20
```

Program Listing 4

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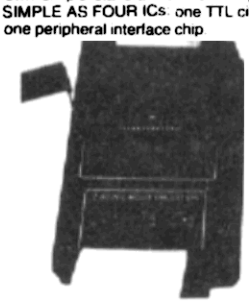

When the In-Circuit-Emulation cable is plugged into the Z-80 socket of your stand-alone system, the system becomes a part of your TRS-80. You can use the full power of your editor/assembler's debug and trace programs to check out both the *hardware and the software*. Simple test loops can be used to check out the hardware, then the system program can be run to debug the logic of your stand-alone device.

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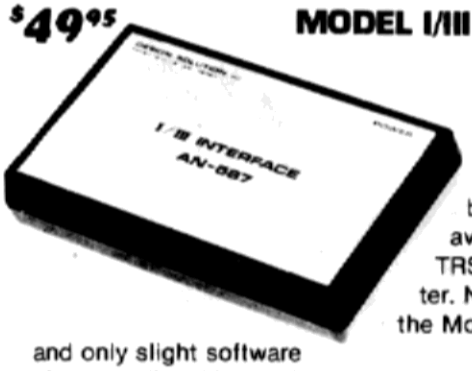

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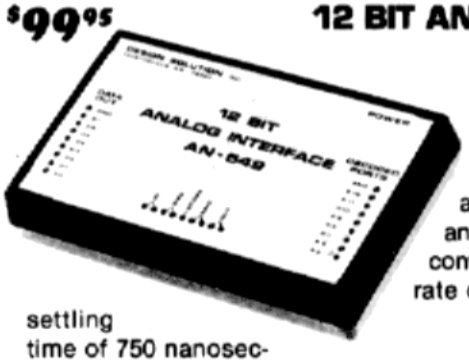

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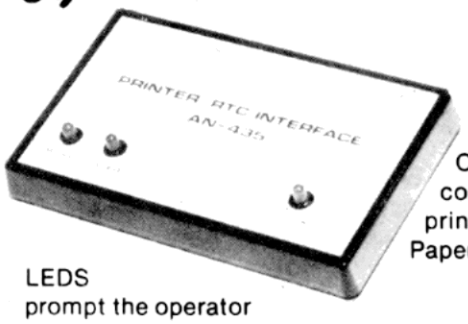

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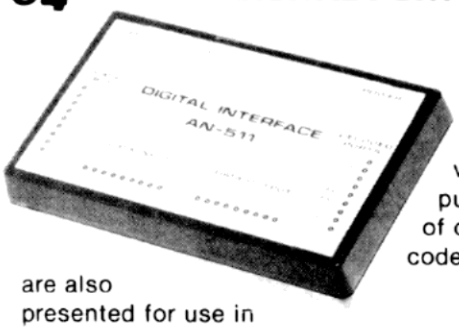

The AN-511 Digital Port Interface provides 8 bits of input data and 8 bits of output data. 8 decoded port addresses are also presented for use in strobing external data latches etc. The Z-80 data bus is also terminated on the AN-511 front panel for raw data requirements. The AN-511 comes complete with power supply and operation manual.

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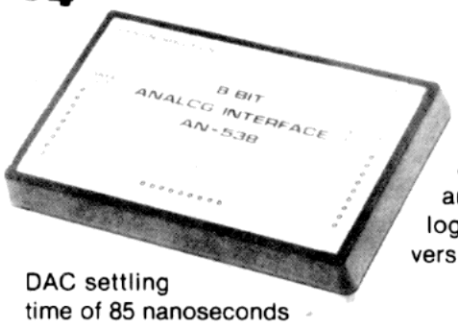

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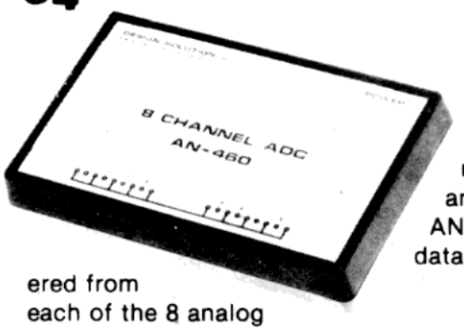

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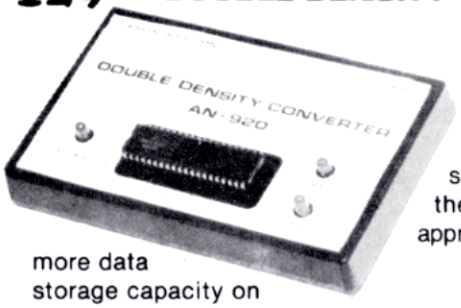

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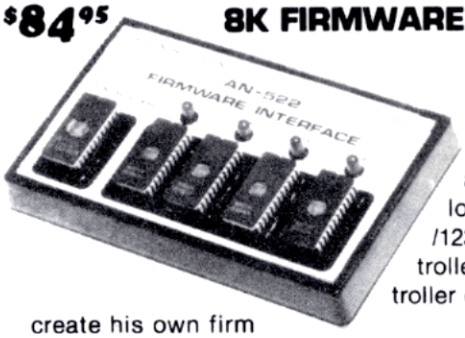

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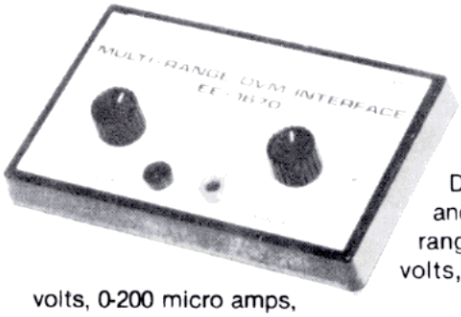

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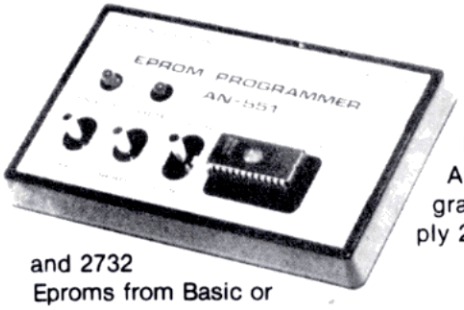

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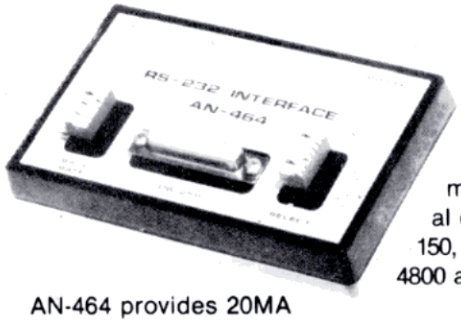

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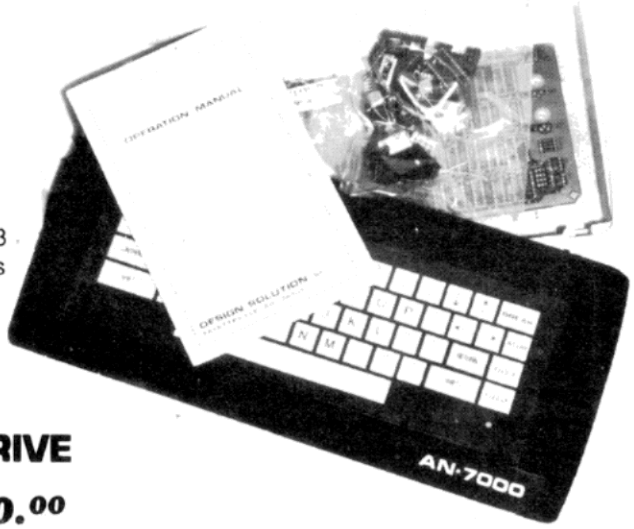

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GAME

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Model I
16K RAM

Can you prevent the destruction of London, Moscow or Tokyo?

Martian Missile Attack

Charles E. Gillen
U.S. Embassy / Seoul
APO San Francisco, CA 96301

Imminent invasion from the Red Planet has forced a united defense against the Martian troop-carrier missiles, which should be arriving any minute. Appointed by the Old World Anti-Missile Coordinator, you scan the sector defense status screen—stretching from London to Tokyo, with killer-satellite launch bases located at Cairo and Delhi.

Below each city the reassuring number 100 shows no damage has yet been inflicted. Your hands familiarize themselves with the arrow-key command console while you recall that the Chinese booster rockets are disgracefully inaccurate, making it impossible to predict where the killer will pop into orbit. At least you have an unlimited arsenal.

The sudden beep-beep-beep of the Martian alert sends your hands to the controls. There he is—sputtering through space, heading for Tokyo! You punch the up button; the diamond-shaped killer materializes just west of Cairo. No time to lose! You hit the down arrow and the killer, its warhead now activated, glows in response. Right, and it races east to smash the Martian.

You thought you had timed the intercept perfectly, but at the last moment the Martian swerves and rips down through the Moscow skyline. The jolt rocks your screen as the indicator below that city drops: 87 percent of the Moscovites survived. No time for regrets—the alarm is sounding again.

Scoring

So much for instructions. If you blast 25 Martians, the invasion is defeated and your performance rated: 1,000 points per kill plus 1,000 points for each surviving percent of the population in each city. The best score possible is 325,000. Lose one of your two launch bases and your final rating is cut in half. The loss of both bases or all three capitals means the end of the game and your population.

This program is an amateur's implementation of the new genre of arcade games. The Program Listing is extravagantly strewn with remark statements detailing the mechanics of the action, but lazy typists can omit every one of these without fear of the UL error. A simple machine language sound routine (from the May 1980 issue of this magazine) is POKEd into a RAM area not used by Level II Basic and thus requires no memory size input; it also leaves your top of memory free for any utilities you like to keep in your keyboard.

There are 66 free bytes between memory locations 16446 and 16511 that are unused on a tape-based system, though if you have disks or are uneasy about getting something for nothing, you can make these changes to put the routine just above location 30000 with automatic memory size:

```
100 CLS:POKE16562,117:
POKE16561,46 ' MEMSIZE: 30000
120 POKE16527, 117: POKE16526, 49 '
USR CALL ADDRESS 30001
130 FORI = 30001TO30029 (and continue as before)
```

The remark statements will facilitate analyzing how the program works, so you can start customizing it to your own taste. The strings holding the names of the cities and satellite bases are in line 160, while the satellite (the non-equal sign) and the activated version in K$ are in line 190. Any of these strings can be changed in this initialization section so long as your replacements are equal in length—i.e., the satellite should occupy just two character spaces.

```
MISSILES FROM MARS

A FLEET OF INVADING MISSILES FROM THE RED PLANET IS
APPROACHING THE EARTH AT HIGH SPEED.

THE CONTROLS OF YOUR KILLER-SATELLITE BASES ARE:

    UP ARROW          LAUNCH THE KILLER
    DOWN ARROW        ENERGIZE THE KILLER
    RIGHT ARROW       ORBIT TO THE RIGHT
    LEFT ARROW        ORBIT TO THE LEFT

INTERCEPT THE MARTIANS AND SAVE EARTH.  PLEASE.
```

Fig. 1. Instruction screen from game.

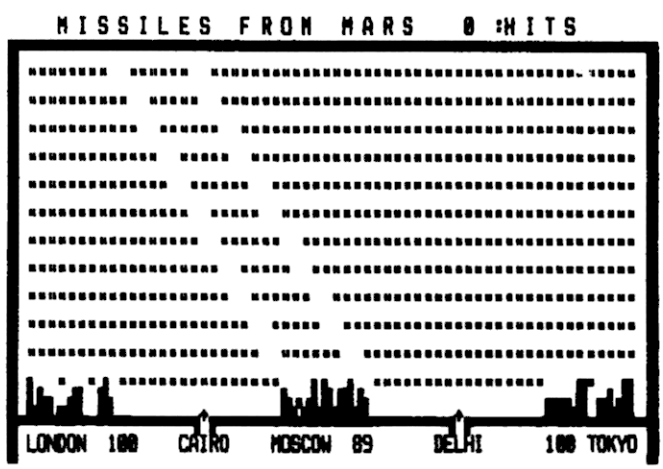

Fig. 2. Two Martians have landed; one did some damage to Moscow.

In line 210, 34 in STRING$ (60,34) is the CHR$ code for the quotation mark, which I like because it resembles the Martian invader—thus making him a bit harder to spot. I wanted to fill the sky with something he could erase, to leave a clear trail as he dropped. As the Martian falls, the program uses the Point statement to check the X,Y coordinate location immediately below him. Collision with an illuminated graphic block (such as our killer) at the proper altitude will trigger the explosion, but the Point statement does not react to an alphanumeric such as the quotation mark. You might find you prefer the period (46), plus sign (43) or some other mark.

When the falling Martian reaches coordinate Y = 24, he quickly takes evasive action if RND(10) in line 390 is three or less. It would be possible to reduce that 24 and make him evasive at a slightly higher altitude, but then his increased slant range might take him right off the screen into an FC error.

Setting screen limits to prevent an FC error is easily done, but would introduce more If...Then conditions and delay his headlong dash to Earth. Instead, the program ensures he remains within bounds by preventing any initial trajectory that would merit the FC complaint. I found that Y = 24 was the nastiest spot to begin swerving, as it lies just above the killer's orbit. If you still want to make a change, try altering the three in line 390 for more or less curve balls.

In line 430, PP = 644 + RND(52) determines where the killer will pop into orbit (it always stays on the same screen line). Increasing 644 and decreasing 52 by the same small number will make all the successive launches orbit in a smaller area. If you make PP (for Print position) a fixed location, such as PP = 672, the satellite will go into orbit there every time.

The game is a greater challenge if your keyboard has a CPU (central processing unit) speed-up modification such as the Archbold kit, which makes my late 1979 model zip along in double time. Without such a modification, you can speed up the main program loop by cutting out the SR = USR(DU + Y) sound routine call in line 420. Unfortunately, this is the Martian's falling wail and it would be a shame to silence him.

Lines 450-460 govern the left and right movements of our satellite, which moves in increments of two character spaces—see the PP = PP + 2 or − 2 statements. By changing that two to a three, the killer will go faster, but you might find it hard to stop right under a falling Martian. These two lines also limit the left-right travel of the satellite, to keep it on the screen.

My sons Graham and Glenn, who were the killer's test pilots, suggested restricting the killer's horizontal path to the appropriate half of the view screen when one of the launch bases is knocked out. I've left this improvement up to you—lines 560 and 570 contain two "base-destroyed" flags which can be checked in 450 and 460, and the permissible limits shortened accordingly.

The 25 which sets the goal of Martians to be blasted per game is found in line 510: IF MK = > 25 THEN...etc. Raise or lower this value as you like. The section beginning at line 530 is the stock-taking phase—the Martian hits Earth on coordinate Y = 43 so we check his final X position to see what the damage was. In the center of each city is a secret bulls-eye two pixels wide. In the case of London, as seen in line 530, the city instantly becomes a dead crater if X = 12 or X = 13.

Line 560 has a similar four-pixel target zone for Cairo Base, expressed as: IF X>35 AND X<42. A direct hit nulls the location's name string and sets the appropriate flag to zero, to

BK$	Backspaces cursor while drawing graphics
LN$	London
MW$	Moscow
TY$	Tokyo
CO$	Cairo
DI$	Delhi
BL$	Graphic for missile crater
EX$(1to4)	Graphic strings for explosion
S$	† active launch base
SB$	< > satellite after launch
SA$	Temporarily holds S$ or SB$
K$	Killer satellite graphic
P$	INKEY$
DU	256, used to produce sound as function of Y
LN	100, starting undamaged value of London
MW	Ditto for Moscow
TY	Ditto for Tokyo
SK	Print position for filling the sky
I	General counter
Y1	Used in random drawing of city skyline
X1	Ditto
H	Ditto
V	Ditto
RV	0 = missile course is not reversed yet
TD	General counter in time delay loops
X	X coordinate of Martian missile
Y	Y ditto
Z	1 or − 1, increments X axis to swerve missile
SR	USR call to sound routine
S	1 when a killer satellite is launched
PP	Print position of killer satellite
P	Peek(14400) for arrow key control
K	1 = satellite is activated
SO	1 = Cairo base demolished
SL	1 = Delhi base ditto
MK	Number of Martians blasted
FR	Final rating
PC	Percent of population surviving

Table 1. Variable List

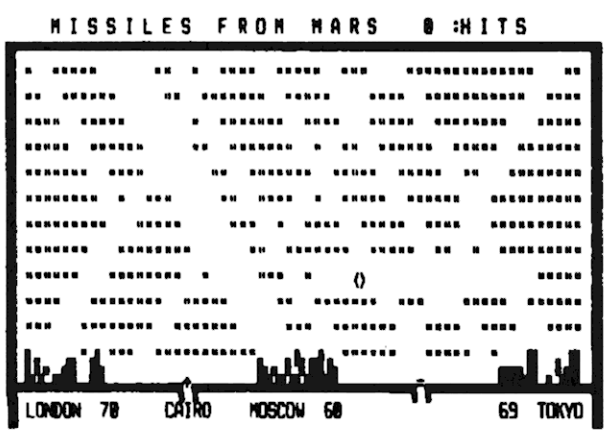

Fig. 3. A killer-satellite is visible before activation of the warhead.

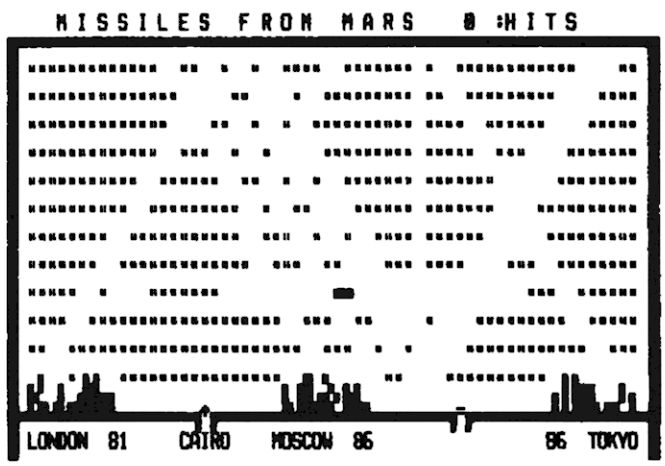

Fig. 4. The armed killer; looks like Delhi base is bombed out.

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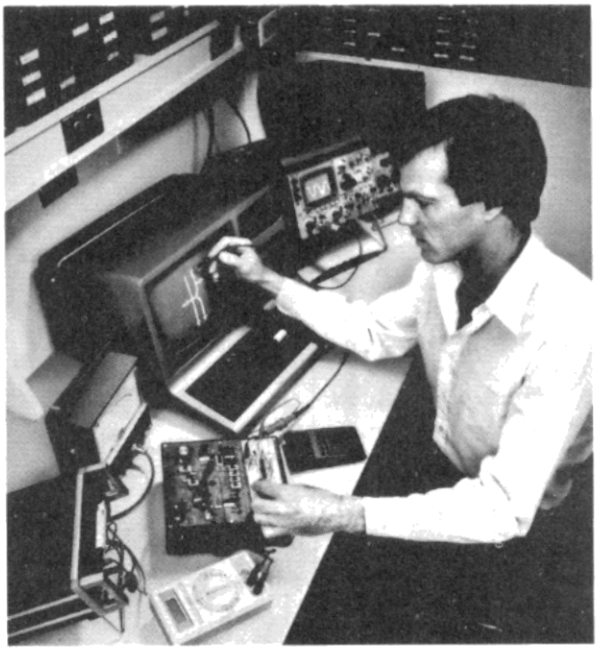

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drop it from the bottom status update printed by lines 270-300. If a Martian splats down in open country, he quickly perishes without causing any damage.

The final score is calculated by line 790, translated to read: The single precision "final rating" is the number of Martians killed times 1,000, plus the sum of the survivors in London, Moscow and Tokyo multiplied by 1,000. Double precision was needed to handle the impressive maximum possible score. This explanation should help you change the scoring system, if a maximum of 325,000 points doesn't satisfy you.

So there you are—considerable action, graphics and sound, without fancy programming, high-resolution or machine code (except for the 29 bytes for the sound routine). Judging from my sons' frequent anguished cries as a city or base is obliterated, the entertainment value will repay your typing effort. When you improve Missiles from Mars, why not send me a copy? ■

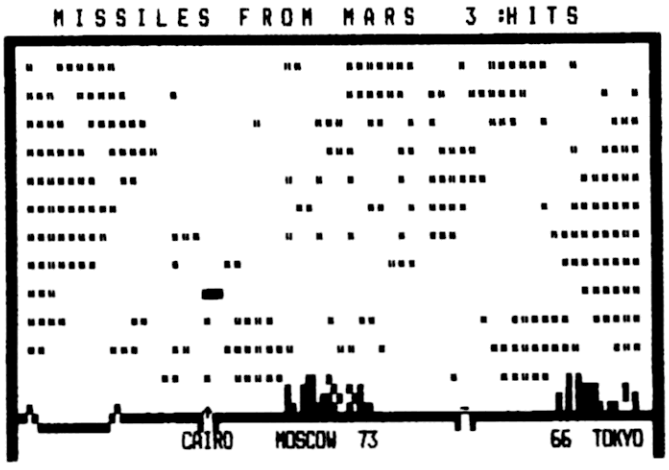

Fig. 5. London is cratered.

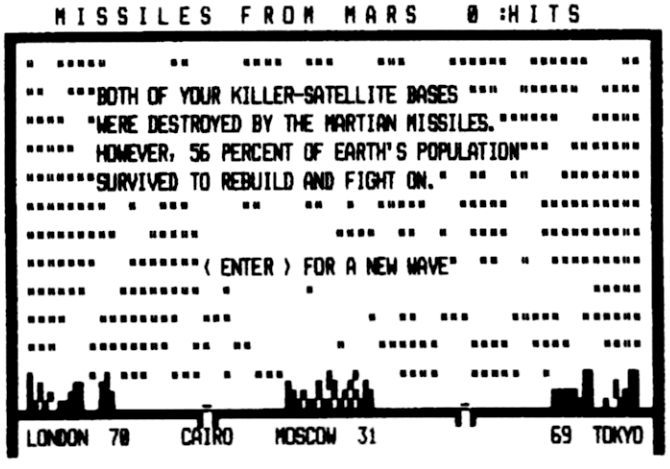

Fig. 6. One of the possible endings of the game.

Program Listing

```
100 REM SOUND ROUTINE IS IN RAM NOT USED BY LEVEL II. NO MEMSIZE
    IS NEEDED.
110 CLS:GOSUB840'GET INSTRUCTIONS
120 POKE16527,64:POKE16526,62'USR CALL ADDRESS IS 16446
130 FORI=16446TO16474:READ DT:POKEI,DT:NEXT'POKE SOUND ROUTINE
140 DATA205,127,10,62,1,14,0,237,91,61,64,69,47,230,3,179,211,25
5,13,40,4,16,246,24,242,37,32,241,201
150 REM INITIALIZE CONSTAINTS AND GRAPHIC STRINGS
160 CLEAR200:RANDOM:DEFINTA-E,G-Z:BK$=CHR$(26)+STRING$(5,24):DU=
256:LN=100:MW=LN:TY=LN:LN$="LONDON":MW$="MOSCOW":TY$="TOKYO":CO$
="CAIRO":DI$="DELHI":BL$=CHR$(137)+STRING$(7,176)+CHR$(134):E$=C
HR$(194)
```


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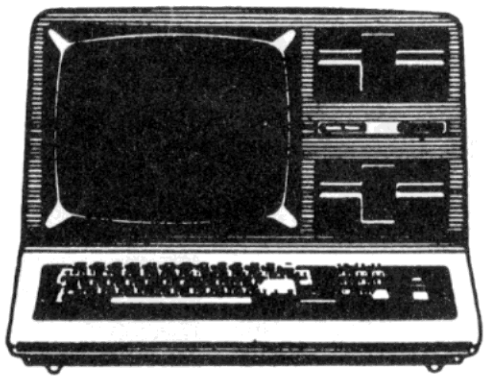

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Program continued

```
170 EX$(1)="  "+CHR$(176)+"  "+BK$+" "+CHR$(131)+CHR$(140)+CHR$(
131)+" ":EX$(2)="  "+CHR$(176)+"  "+CHR$(176)+" "+BK$+" "+CHR$(140
)+CHR$(131)+CHR$(140)+" ":EX$(4)=CHR$(176)+CHR$(140)+" "+CHR$(14
0)+CHR$(176)
180 EX$(4)=EX$(4)+BK$+CHR$(140)+CHR$(176)+" "+CHR$(176)+CHR$(140
)
190 EX$(3)=" "+CHR$(176)+CHR$(140)+CHR$(176)+" "+BK$+CHR$(131)+C
HR$(140)+CHR$(176)+CHR$(140)+CHR$(131):SS=CHR$(91):SB$="<>":K$=C
HR$(131)+CHR$(131)
200 REM DRAW GRAPHIC DISPLAY
210 FORI=0TO127:SET(I,3):SET(I,43):NEXT:FORI=4TO47:SET(0,I):SET(
1,I):SET(126,I):SET(127,I):NEXT:PRINT@915,S$;:PRINT@948,S$;:SET(
37,44):SET(40,44):SET(87,44):SET(90,44):SK=138:FORI=1TO12:PRINT@
SK,STRING$(60,34);:SK=SK+64:NEXT
220 REM NEXT TWO LINES DRAW THE RANDOM CITY SKYLINES
230 Y1=43:X1=4:GOSUB240:X1=54:GOSUB240:X1=106:GOSUB240:GOTO270
240 FORH=X1TOX1+16:FORV=Y1TOY1-(RND(5)-1)STEP-1:SET(H,V):NEXT:NE
XT:RETURN
250 REM NOW BEGINS THE MAIN PROGRAM LOOP
260 REM LINES 270-300 PRINT BOTTOM INFO LINE ON SCREEN
270 PRINT@962,CHR$(252);:PRINT@962,LN$;:IFLN>1THENPRINT@969,LN;
280 PRINT@977,CO$;:PRINT@986,MW$;:IFMW>1THENPRINT@993,MW;
290 PRINT@1062,DI$;:IFTY>1THENPRINT@1012,TY;
300 PRINT@1017,TY$;
310 REM PRINT THE TOP TITLE AND SCORE LINE
320 PRINT@5,"M I S S I L E S   F R O M   M A R S";:PRINT@44,MK;"
 M I S";
330 FORI=1TO3:FORTD=1TO300:NEXT:SR=USR(2760):NEXT'MARTIAN ALERT
340 REM HERE COMES THE FIRST MARTIAN MISSILE
350 RV=0:RANDOM:FORTD=1TORND(5)*100:NEXT:X=1+RND(124)'THE X IS P
OINT THE MARTIAN ENTERS YOUR RADAR SCOPE
360 IFX<43THENZ=1ELSEIFX>83THENZ=-1'SELECT LEFT/RIGHT SLANT
370 FORY=4TO42'LENGTH OF DROP
380 IFY<24THEN420'HIGH ALTITUDE, DON'T NEED EVASIVE ACTION
390 IFRND(18)>3THENRV=1'IF Y>24 THEN 30% CHANCE OF SWERVE
400 IFRV=0ANDZ=-1THENZ=1:RV=1:GOTO420'SWERVE RIGHT
410 IFRV=0ANDZ=1THENZ=-1:RV=1'SWERVE LEFT
420 SET(X,Y):SR=USR(DU+Y):RESET(X,Y):X=X+Z'SHOW MARTIAN
430 IFS=0THENP$=INKEY$:IFP$=S$THENSA$=SB$:PP=644+RND(52):PRINT@P
P,SA$;:S=1'INKEY$ AND S FLAG ALLOW ONE LAUNCH ONLY
440 IFSTHENP=PEEK(14400)ELSEP=0:GOTO480'LAUNCHED. WHAT NOW?
450 IFP=32THENPRINT@PP,E$;:PP=PP-2:IFPP<645THENPP=645:GOTO470'KI
LLER ORBITS LEFT
460 IFP=64THENPRINT@PP,E$;:PP=PP+2:IFPP>696THENPP=696'KILLER ORB
IT TO THE RIGHT
470 IFP=16THENSA$=K$:K=1'DOWN ARROW ARMS KILLER SATELLITE
480 IFSTHENPRINT@PP,SA$;'LAUNCHED? PRINT <> KILLER
490 IF(Y<36)ANDPOINT(X,Y+1)THENGOTO510'GOTO INTERCEPT ROUTINE
500 NEXTY:GOTO530'NO INTERCEPT SO MUST HAVE LANDED. GO LOOK!
510 MK=MK+1:FORI=1TO4:PRINT@PP-66,EX$(I);:SR=USR(DU1*I+MK):NEXT:
PRINT@PP-66,CHR$(197)BK$CHR$(197);:SA$="":S=0:IFMK=>25THEN780ELS
E270'SHOW KILLER BLAST. UPDATE SCORE. KILL 25 YET?
520 REM WHAT HAPPENS WHEN ICBM LANDS AT GROUND LEVEL? (Y=43)
530 IFX=12ORX=13THENLN$="":LN=0:GOTO650'LONDON DIRECT HIT
540 IFX=62ORX=63THENMW$="":MW=0:GOTO630'MOSCOW DIRECT HIT
550 IFX=113ORX=114THENTY$="":TY=0:GOTO610'TOKYO DIRECT HIT
560 IFX>35ANDX<42THENCO$="":PRINT@915,"";:SO=1'CAIRO BASE DEAD
570 IFX>85ANDX<92THENDI$="":PRINT@940,"";:SL=1'DELHI BASE DEAD
580 IFSOANDSLTHEN720'BOTH BASES ARE OUT OF ACTION. END IT.
590 REM CITY DAMAGE. WHEN DOWN TO 0, CITY IS A CRATER
600 IFX>106THENTY=TY-(10+RND(10)):GOSUB700'TOKYO DAMAGED
610 IFTY<1THENTY$="":PRINT@884,CHR$(201);:PRINT@948,BL$;'TOKYO I
S NOW JUST A CRATER
620 IFX>53ANDX<71THENMW=MW-(10+RND(5)):GOSUB700'MOSCOW DAMAGED
630 IFMW<1THENMW$="":PRINT@859,CHR$(201);:PRINT@923,BL$;'MOSCOW
IS A CRATER
640 IFX<21THENLN=LN-(10+RND(10)):GOSUB700'LONDON DAMAGED
650 IFLN<1THENLN$="":PRINT@834,CHR$(201);:PRINT@898,BL$;'LONDON
IS A CRATER
660 IFLN=0ANDMW=0ANDTY=0THEN760'THREE CITIES DEAD. END IT.
670 FORI=1TO30:SR=USR(506):NEXT'MARTIAN SPLATS IN OPEN COUNTRY
680 IFSTHENPRINT@PP,E$;:S=0:SA$="":GOTO270ELSE270'BACK TO MAIN L
OOP FOR NEXT MARTIAN
690 REM HERE'S THE GOSUB THAT SHAKES THE SCREEN ON IMPACT
700 FORI=1TO3:OUT255,15:SR=USR(2756):OUT255,PEEK(16445):SR=USR(2
700):NEXT:RETURN
710 REM PRINT ONE POSSIBLE RESULT
720 PRINT@201,"BOTH OF YOUR KILLER-SATELLITE BASES";:PRINT@265,"
WERE DESTROYED BY THE MARTIAN MISSILES.";
730 PC=INT(((LN+MW+TY)/300)*100):PRINT@329,"HOWEVER,";PC;"PERCEN
T OF EARTH'S POPULATION";:PRINT@393,"SURVIVED TO REBUILD AND FIG
HT ON.";
740 GOTO810' AND START AGAIN
750 REM HERE'S THE BAD NEWS
760 PRINT@201,"ALL OUR CITIES WERE DESTROYED BY THE";:PRINT@265,
"MISSILE MEN FROM THE RED PLANET.";:PRINT@329,"YOU CONTINUED FIG
HTING TO THE LAST, BUT";:PRINT@393,"THE MARTIANS FINALLY CONQUER
ED THE EARTH.";:GOTO810
770 REM HERE'S THE FINAL SCORE:
780 PRINT@205,"YOUR ANTI-MISSILES BLASTED 25 OF THE";:PRINT@265,
"DREADED MARTIAN INVADERS OUT OF EARTH'S SKIES.";:PRINT@393,"CON
SIDERING THE DAMAGE SUFFERED BY OUR CITIES,";:PRINT@464,"YOUR FI
NAL RATING IS: ";
790 FR=MK*1000+((LN+MW+TY)*1000):IFSO OR SLTHENFR=INT(FR/2)
800 PRINTFR;'LOSING A BASE CUTS FINAL RESULT IN HALF. THE FR IS
A FUNCTION OF AMOUNT OF CITY DAMAGE
810 PRINT@595,"< ENTER > FOR A NEW WAVE";
820 IFINKEY$<>CHR$(13)THEN820ELSERUN' START ALL OVER AGAIN
830 REM HERE IS THE FRONT PAGE:
840 PRINTTAB(5)"M I S S I L E S   F R O M   M A R S":PRINT:PRINT
:PRINTTAB(5)"A FLEET OF INVADING MISSILES FROM THE RED PLANET IS
":PRINTTAB(5)"APPROACHING THE EARTH AT HIGH SPEED.":PRINT
850 PRINTTAB(5)"THE CONTROLS OF YOUR KILLER-SATELLITE BASES ARE:
":PRINT:PRINTTAB(10)"UP ARROW";TAB(30)"LAUNCH THE KILLER":PRINTT
AB(10)"DOWN ARROW";TAB(30)"ENERGIZE THE KILLER"
860 PRINTTAB(10)"RIGHT ARROW";TAB(30)"ORBIT TO THE RIGHT":PRINTT
AB(10)"LEFT ARROW";TAB(30)"ORBIT TO THE LEFT"
870 PRINT:PRINTTAB(5)"INTERCEPT THE MARTIANS AND SAVE EARTH.  PL
EASE.
880 IFINKEY$=""THEN880ELSERETURN' NO MORE TYPING!!
890 REM ** ALL REMS CAN BE LEFT OUT WITHOUT FEAR **
900 REM     THIS IS AN ORIGINAL PROGRAM BY
910 REM     CHARLES E. GILLEN
920 REM     U.S. EMBASSY / SEOUL
930 REM     APO SAN FRANCISCO 96301
940 REM     DATE: 9-10 MAY 1981
```

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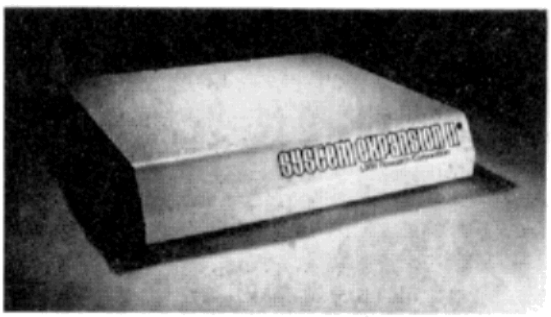

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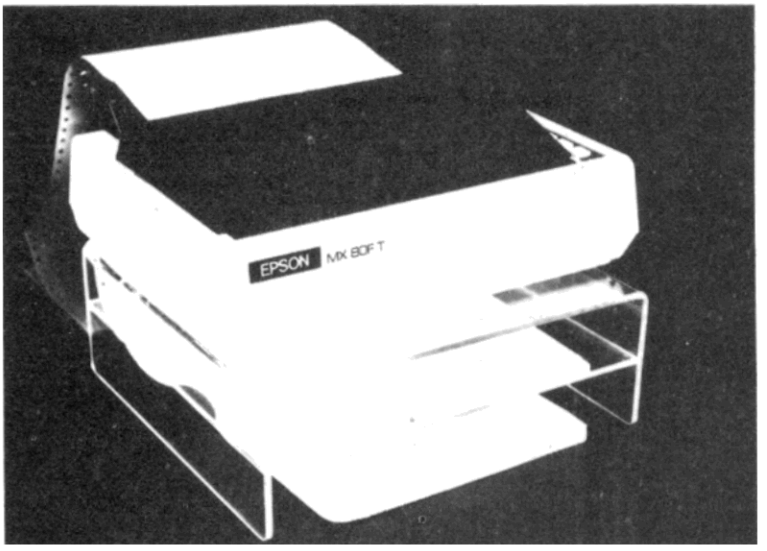

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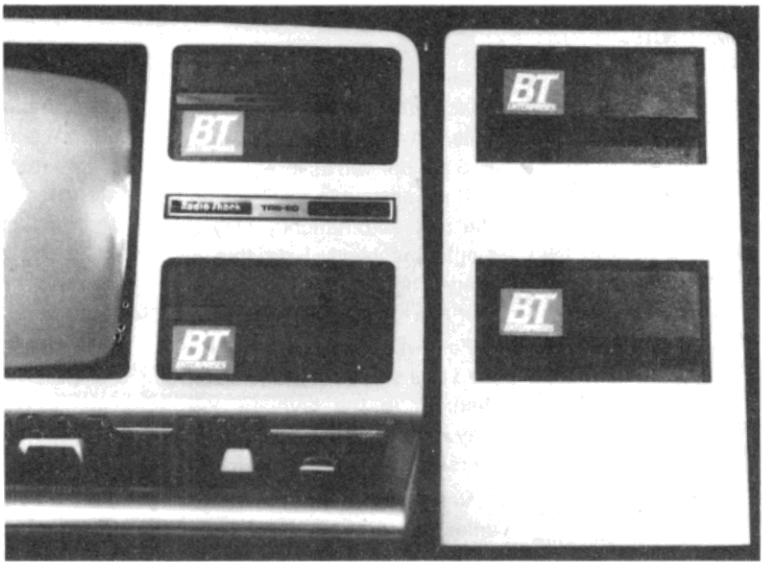

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If you want a programming method that works for me 100 percent of the time, but was devised by someone that doesn't know what he is talking about, read on.

I have no formal training in programming. But, after I caught the bug like most of you, and sat before the keyboard for hours on end, something began to rub off.

Today, I successfully write programs for police and fire departments and other private businesses as a result of what I have taught myself. Sometimes I even get paid.

Getting started as a freelance programmer is tough, but using the following standard approach can help you, whether you're writing for the games or business market, or for personal enjoyment.

I write my programs in modules, reserving groups of line numbers for specific tasks. This helps me not only to compose programs faster, but also to service an account faster.

Lines 10-50 of my programs are my standard title page showing title, author, version, date, any special messages and the purpose of the program. I follow this with a string of 64 graphic blocks. That fills the top two-fifths of the screen, and the bottom is then clear for changeable items.

Lines 60-99 initialize my programs. First, I clear string space, then I define my variables; A-F are always strings, F-S are defined as integers, T is defined as double precision and the rest automatically stay as single precision. I do this on every program, whether it needs it or not.

For every program I write, I load this standard module, and then fill in the balance. You may want to change the parameters, but the concept is valid.

Next, I dimension the arrays, unless an array is going to be dimensioned later from either keyboard input, computation or data from a disk file.

Now, read the data statements, if that is practical.

By going to a subroutine in the 6000 range, I load any files that the program will need. If possible, open any files that you intend to use.

If you are loading a sequential file or reading data statements of any length, tell the user what is going on. Also tell him the file and item number you are using. That flashing number is very comforting to the inexperienced user who so frequently asks, "How do you know the computer is doing something?"

What about Memory?

Someone is saying, "But all that takes time and more memory." True! Well spent time and memory. I work with a 48K machine, so memory is not usually that precious.

Programming speed is not as important as you might think. The operator appreciates your care and isn't worried about the added seconds the machine needs to process an extra print instruction or two. Besides, their old method took much longer.

Next, initialize any other variables. The menu, if there's to be one, starts at line 100.

The workings of the program are next. Generally, this consumes lines 100-500. My technique calls for a number of prepared subroutines, that I need only to merge with the main program. That's why I follow the same line numbering scheme all the time and use the same variable structure.

I reserve lines 1000-4999 for multiple use programs. If the menu offers a choice, it generally uses the On...GOTO statement to find the part of the program that will handle the chosen function. Those minimodules are in these lines.

Lines in the 5000 range are always printer output and sometimes display output, but only if they are being handled at the same time; screen displays are normally in the 8000 area.

Disk Input/Output

Lines labeled 6000 always deal with disk I/O. Files are opened, closed, added to, read and changed by a series of small subroutines. Just assign file variables a given value, and you will be able to use the same subroutine for most programs.

An example is the TRS-80 field statement that looks like this: FIELD 1, 5 AS A, 10 AS B, 15 AS C. When you are using a statement in this form, you must write it each time.

I write FIELD 1, (SR-1)*L1 AS A only once and make it a subroutine. SR is the subrecord number and comes from a formula you can find in the Radio Shack disk manual.

It works whether the record length is 12 bytes or a full 256 bytes. Always use A as the variable to accept the material coming from the disk.

Generally, I use MID$ to divide the variable A into its smaller parts as in the first field statement (remember, A was defined earlier as a string).

Lines in the 10000 range are always INKEY$ routines, the most effective way for an operator to input from the keyboard. You can place information on the screen exactly; you can use interesting cursors; you can indicate the length of allowable information with graphic blocks, and you can imbed other instructions in the routine.

Exit is one. In my INKEY$ routine, B accumulates the individual characters as they are entered. B is tested constantly to see if it equals exit. If so, it means we are done and the rou-

tine sends it to another line in the 10000 area that tells the computer what to do.

Lines in the 15000-19999 range are working subroutines that generally apply only to a particular program.

From the 20000 area I can again select from my standard catalog of subroutines. For example: 20010 INPUT"PRESS ENTER TO CONTINUE";Q. Q is the variable that always means nothing. A program with Q as its first letter is only for testing; I can erase at any time. 20010 concludes with a RETURN.

Lines 30000 and beyond are for data statements and sometimes routines that initialize variables. For example: 34090 might be D1 = "JOB COSTING PROGRAM". If the phrase, Job Costing Program, is going to be used in the display or printout more than once, it may pay to set it up as variable D1 instead of typing the words several times over.

Lines above 40000 are only for notations. I use lines zero through nine for this as well. These are remark statements that help me remember what I am doing. Before delivering the program to my client, I run it through a compress program that removes these remarks and spaces. However, on my copy I retain all my notes for any necessary changes or debugging.

How I Use Variables

A is generally the string that is being processed. A(X) or AA(X), and variations on that theme are the string arrays being input from disk or keyboard. Variables starting with B are, generally, material developed by the program. C variables are usually transitory.

For example, "CORRECT (Y/N)" might be an input statement (it is a standard one available in my 20000 area list) followed by C2. C2 is a string variable to accept the "Y" or "N".

I use D for the string arrays of headings, titles or other material necessary for orderly displays or printouts. While E and F are also strings, only F has a set function: F is for file names when going to disks.

I use I, J, K and sometimes X for counting, as in loops, etc.

Normally, variable L refers to length. L(X), read early in the program, represents the maximum length of each item that can be input from the keyboard. INKEY$ wants to know this, so I display graphic blocks the length of L(X). INKEY$ will not allow anything longer than those blocks to be input.

P is for position. P(X) is read early too, telling INKEY$ where to put those graphic blocks and other program items. I always make P equal a constant or equal the array P(X). I use it in countless other print @ P statements throughout the program.

T is always double-precision and keeps all the longer numbers and totals of columns on reports.

What does all this do for me? What about debugging? By structuring each program in the same way, I can usually find a troublesome line. If the problem is disk I/O, I look in the 6000 range.

I also know the variable to look for. I might not know the Total of Items Shipped is T3, but I know it starts with T and I can find those variable references. I hope most of you have either a disk operating system or a program that prints your variables.

Mystery Mastered

This may take some of the mystery out of programming, but I define mystery as those secret and frustrating hours spent in my basement computer room trying to find a program bug.

Locally, good programmers are charging $40-50 an hour. With my speed I didn't feel I could charge $110,456 for a simple 5000 byte program.

On my first job, I quoted a price for the finished running product, and lost my shirt.

Now, with my standardized approach I can charge more, since I work faster and better. Whether you want to program for fun or profit, or both, try some variation of my system. I'd be interested in hearing your ideas. ■

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Frequently when writing a program there comes a time when something must be displayed on the screen for an indefinite duration. The computer sits there, patiently loafing, while waiting for the operator to make some response.

One method of providing this response is to construct a subroutine relying on the input statement.

```
2000 Print @ 950, Enter;
2010 Input A$
2020 Return
```

In this routine, line 2000 positions the prompt in the center of the bottom line. Line 2010 is the input statement and line 2020 tells the computer to return from where it was called by a GOSUB. Multiple lines are not really needed, so, by using colons, the whole thing could be written on one line, thus saving a few bytes of memory.

```
2000 Print @ 950, Enter;:
Input A$: Return
```

This method is neat, simple, effective and *dull.*

Now, no one likes a dull program. So, at the expense of a few additional bytes of memory, let's explore a method to make this routine more exciting.

Adding Polish

This wondrous new method is called PEEKing the keyboard.

```
900 X6 = PEEK(14400)
910 PRINT @ 970, "PRESS THE
SPACE-BAR TO CONTINUE";
920 FOR I = 1 to 50: NEXT I
930 IF X6 = 128 THEN RETURN
940 PRINT @ 968,STRING$
(35,CHR$(143));
950 FOR I = 1 TO 2: NEXT I
960 GOTO 900
```

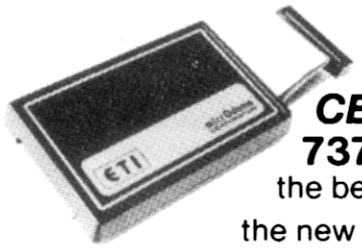
To make it *perfectly clear,* we'll go through it line by line. Line 900 assigns the value of whatever is in memory location 14400 to variable X6. Line 910 prints the prompt in the bottom center of the screen. Line 920 is a delay loop; we want the prompt to stay there long enough to be seen.

As you have no doubt concluded, this subroutine is a loop. Line 930 is our escape hatch back to the main program. To use the hatch effectively, the computer compares the value of variable X6 to 128. If it's a match, away we go.

What, you may ask, has the value of 128 got to do with anything? In an article of the June 1980 issue of *80 Microcomputing* it is explained that the condition of the keyboard (which keys are depressed) is determined by scanning certain locations in memory. Whatever the value in memory is at any given instant tells us something. In this case that something is if memory location 14400 has a 128 stored in it, then the space bar is depressed. Other values for memory location 14400 which might be useful for similar routines are: 1 = Enter, 2 = Clear, 4 = Break, 8 = ↑, 16 = ↓, 32 = ←, 64 = →, and, as we saw earlier, 128 = Space.

However, if the space bar is not depressed at this instant, there is no 128, so line 940 uses the string function to print a line of graphic blocks on top of our exit prompt. Thanks to line 950, it stays there for two counts and then, in line 960, we loop back to 900 to do it again.

The effect is a blinking prompt, sure to get your attention and add some polish to that dull program. ■



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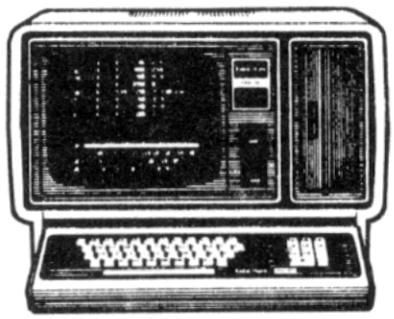

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3)	Update the stack pointer.	The current stack pointer is saved in a holding cell. The next stack pointer is loaded in place.
4)	Increment the program-counter cell.	
5)	Check for the end of all the routines.	If the routines are all finished, return control to the user.
6)	Pop all registers.	
7)	Enable the interrupt and return.	

Table 1. Service Routine Functions

R.F. Genovese
Department of Psychology
University of North Carolina
Chapel Hill, NC 27514

Since microcomputers only run one program at a time they can only perform one task at a time. This article explains how to execute several programs simultaneously using an interrupt generator and software.

Although the article deals specifically with the TRS-80, the software can be used with other Z80 based microcomputers.

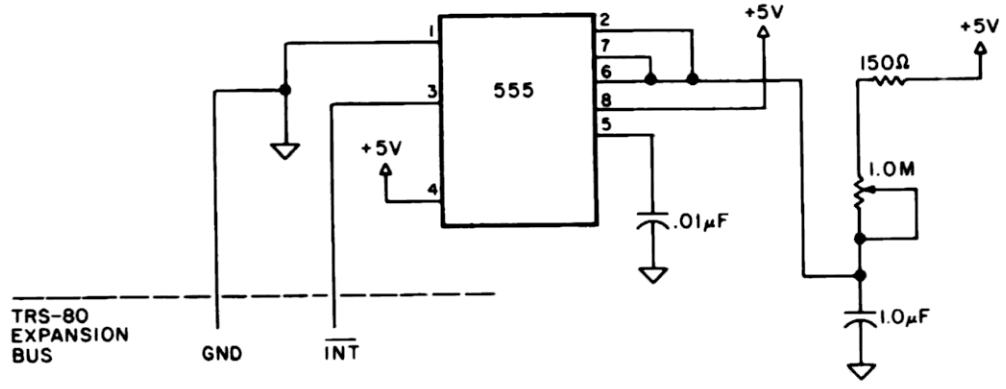

Fig. 1. A Simple Interrupt Generator

Interrupt Processing

The Z80 CPU accepts two types of interrupts: maskable and non-maskable. Acknowledgment of a maskable interrupt is under software control; we are interested in this function.

After each complete instruction cycle the CPU examines the interrupt input. If this line is low an interrupt pulse is present and the contents of the program counter (PC) register are pushed onto the stack. Execution continues at another address. The routine at this address is completed by a Return. The address where the first program was interrupted is pushed back into the PC register and execution continues.

Since microprocessors are very fast you can run several programs at once by dividing the execution time. This type of interrupt often allows microcomputers to check alarms, keep time, and still run other programs. Use the interrupt function to switch programs.

The Z80 has three modes of maskable interrupts in which

the CPU jumps to different addresses. All three modes are software selectable, but due to TRS-80 hardware, only mode 1 is easily available.

In this mode when an interrupt pulse is present and interrupt processing is enabled, the CPU executes a Restart to location 38H. In a 16K Level II TRS-80, the coding causes a Jump to location 4012H. On power-up the instructions cause a Return. Since this address is in RAM you can alter it and access the interrupt ability.

The major function of the service routine is to manipulate the stack to switch programs. You need a separate stack for each program. The service routine must set the stack pointer to the correct stack.

In addition, the address of the next instruction executed in the program must already be on the stack. After the Return from interrupt, the program jumps to that address. It is necessary to detect when all the programs are finished to return control to the user.

42E9	Free Space
42FF	
4300	Stack 1
43FF	
4400	Stack 2
44FF	
4500	Stack 3
45FF	
4600	Stack 4
46FF	
4700	Sample Program 1
52FF	
5300	Sample Program 2
5DFF	
5F00	Sample Program 3
6AFF	
6B00	Sample Program 4
76FF	
7700	Service Routine Initialization End routine
7FFF	Free space

Table 2. Memory Map

Program Listing 1.

```
                00100 ;*****************************************
                00110 ;***             INIT                  ***
                00120 ;*****************************************
                00130 ;
                00140 ;             PROGRAM NOTES
                00150 ; 1) SET INT VECTOR
                00160 ; 2) SET THE STACK POINTER FOR PROGRAM #1
                00170 ; 3) PUT START ADDRESSES OF PROGRAMS 2-4 ON THE
                00180 ;    CORRECT POSITION ON THEIR STACKS
                00190 ; 4) JUMP TO PROGRAM #1
                00200 ;
777F            00210           ORG     777FH
777F 3EC3       00220 START     LD      A,0C3H
7781 321240     00230           LD      (4012H),A       ;INT VECTOR
7784 210077     00240           LD      HL,7700H        ;SERVICE ROUTINE
7787 221340     00250           LD      (4013H),HL      ;START ADDRESS
778A 31FF43     00260           LD      SP,43FFH        ;FOR PROG. #1
778D 210053     00270           LD      HL,5300H        ;PROG #2 START
7790 22FE44     00280           LD      (44FEH),HL      ;ON STACK #2
7793 21005F     00290           LD      HL,5F00H        ;PROG #3 START
7796 22FE45     00300           LD      (45FEH),HL      ;ON STACK #3
7799 21006B     00310           LD      HL,6B00H        ;PROG #4 START
779C 22FE46     00320           LD      (46FEH),HL      ;ON STACK #4
779F C34047     00330           JP      4700H           ;START PROG #1
                00340 ; * NOTE * PROG #1 MUST ENABLE THE INT!
777F            00350           END     START
00000 TOTAL ERRORS
                00100 ;*****************************************
                00110 ;***             QUAPRO                ***
                00120 ;*****************************************
                00130 ;
                00140 ;             PROGRAM NOTES
```

Program continues

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Before you do any of this, save all of the registers after each program interruption. The registers associated with the next program are restored and the interrupt enabled at the end of the service routine. Table 1 summarizes the functions of the service routine.

Initialization

After the programs are in place the initialization routine puts instructions to jump to the address of the service routine at the interrupt vector (4012H). Then you must set the stack pointer to the first program.

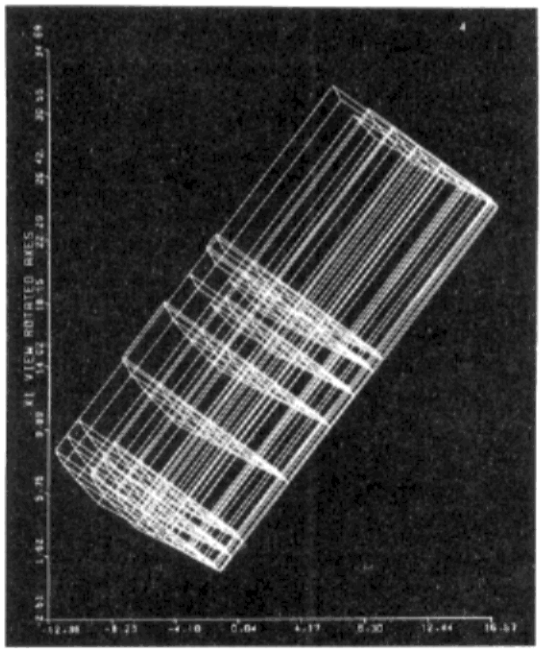
Next, put the starting addresses of the rest of the programs on their respective stacks. When doing this, allow the registers off the stack to be restored. Finally, you can jump to the starting address of the first program.

The first program must enable the interrupt. If it does not, it prevents the whole method from working. Each program should also increment a count-

Program continued

```
                        00150 ; 1) PUSH ALL REG'S (EXCEPT PRIMES)
                        00160 ; 2) DETERMINE THE CORRECT UPDATE ROUTINE
                        00170 ;    A) BY USING A  ROUTINE COUNTING CELL
                        00180 ;       (RCNT) WHICH IS INCREMENTED AND
                        00190 ;       RESET APPROPRIATELY.
                        00200 ; 3) UPDATE THE STACK POINTER (SP)
                        00210 ;    A) SAVE THE LAST SP IN A HOLDING CELL
                        00220 ;    B) LOAD THE NEXT SP FROM A HOLDING CELL
                        00230 ; 4) INCREMENT THE ROUTINE COUNTER
                        00240 ;    A) AS PREVIOUSLY EXPLAINED
                        00250 ; 5) DETERMINE IF ALL ROUTINES ARE FINISHED
                        00260 ;    A) BY CHECKING HOLDING CELLS (SP1,N)
                        00270 ;    B) RTINS ARE INCREMENTED BY EACH PROGRAM,
                        00280 ;       UPON IT'S COMPLETION, AFTER WHICH IT
                        00290 ;       LOOPS ENDLESSLY.
                        00300 ;    C) IF PROGRAMS ARE COMPLETED THE INT MUST
                        00310 ;       BE DISABLED AND CONTROL RETURNED TO THE
                        00320 ;       USER.
                        00330 ; 6) POP ALL REG'S
                        00340 ; 7) ENABLE INTERRUPT
                        00350 ;    A) SET TO IM 1 (UNNECCESSARY FOR TRS-80)
                        00360 ;*****************************************
                        00370 ;
7700                    00380          ORG     7700H
                        00390 ;FIRST SAVE REG'S
7700 F5                 00400 START    PUSH    AF
7701 C5                 00410          PUSH    BC
7702 D5                 00420          PUSH    DE
7703 E5                 00430          PUSH    HL
7704 DDE5               00440          PUSH    IX
7706 FDE5               00450          PUSH    IY
                        00460 ;
                        00470 ;FIND THE CORRECT UPDATE ROUTINE.
7708 3A7277             00480          LD      A,(RCNT)
770B FE02               00490          CP      2
770D 2812               00500          JR      Z,UP2
770F FE03               00510          CP      3
7711 2818               00520          JR      Z,UP3
7713 FE04               00530          CP      4
7715 281E               00540          JR      Z,UP4
                        00550 ;
                        00560 ;THE UPDATE ROUTINES SAVE THE SP AND
                        00570 ;PUT THE NEXT SP IN PLACE.
7717 ED737777           00580 UP1      LD      (SP1),SP
771B 2A7977             00590          LD      HL,(SP2)
771E F9                 00600          LD      SP,HL
771F 181C               00610          JR      INCRC
7721 ED737977           00620 UP2      LD      (SP2),SP
7725 2A7B77             00630          LD      HL,(SP3)
7728 F9                 00640          LD      SP,HL
7729 1812               00650          JR      INCRC
```

Program continues



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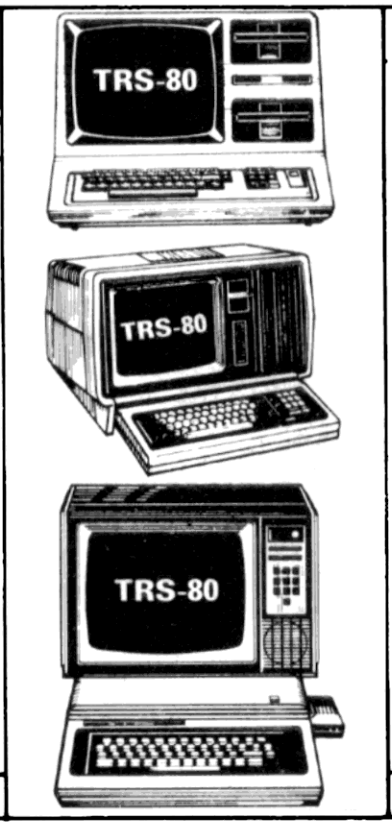

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ing cell when completed, and then loop endlessly. The service routine uses these cells to detect the end of all programs, when control returns to the user.

The Program

Program Listing 1 demonstrates the multiprogramming technique. It is made up of six parts: the initialization routine, the service routine, and four sample programs. The sample programs are quite simple, designed only to show the method in action. Table 2 illustrates the memory configuration for the application.

Load the four programs and the service routine separately without execution. Hit the break key after each load is completed.

Next, load and execute the initialization program. All four programs should run concurrently, finish, and return control

Interrupt Hardware

Before you can use multiprogramming you must have hardware to generate the interrupts. Many possibilities provide this function. Fig. 1 is a schematic for a low cost interrupt generator based on a 555 timer. The parts list is given in Table 3.

In addition to the circuit, you need a regulated +5 V power supply and an edge card connector to gain access to the TRS-80. Adjusting the potentiometer varies the speed of the interrupt pulse. The device is crude, but will do the job.

If you need greater accuracy (for real time functions), use a more sophisticated device.

Considerations And Restrictions

Since execution constantly switches across several programs, none of the programs should utilize the Z80 prime registers.

Multiprogramming puts some restrictions on the stack size. In addition to program use, each stack must have space for saving all of the registers for the service routine. Because the stack size is controlled by the user, this should not be a big problem.

Program continued

```
772B ED737B77 00660 UP3     LD      (SP3),SP
772F 2A7D77   00670         LD      HL,(SP4)
7732 F9       00680         LD      SP,HL
7733 1808     00690         JR      INCRC
7735 ED737D77 00700 UP4     LD      (SP4),SP
7739 2A7777   00710         LD      HL,(SP1)
773C F9       00720         LD      SP,HL
              00730 ;
              00740 ;INCRCEMENT THE ROUTINE COUNTER.
773D 3C       00750 INCRC   INC     A
773E FE05     00760         CP      5
7740 2002     00770         JR      NZ,ENDCK
7742 3E01     00780         LD      A,1
7744 327277   00790 ENDCK   LD      (RCNT),A
              00800 ;
              00810 ;CHECK IF ALL ROUTINES HAVE FINISHED,
              00820 ;IF SO THEN RETURN CONTROL TO USER.
              00830 ;           *** NOTE ***
              00840 ;ALL PROGRAMS MUST INCREMENT AN (RFIN)
              00850 ;UPON COMPLETION!
7747 3A7377   00860         LD      A,(RFIN1)
774A FE01     00870         CP      1
774C 2018     00880         JR      NZ,REGPOP
774E 3A7477   00890         LD      A,(RFIN2)
7751 FE01     00900         CP      1
7753 2011     00910         JR      NZ,REGPOP
7755 3A7577   00920         LD      A,(RFIN3)
7758 FE01     00930         CP      1
775A 200A     00940         JR      NZ,REGPOP
775C 3A7677   00950         LD      A,(RFIN4)
775F FE01     00960         CP      1
7761 2003     00970         JR      NZ,REGPOP
7763 C37200   00980         JP      72H
              00990 ;
              01000 ;POP ALL REGISTERS
7766 FDE1     01010 REGPOP  POP     IY
7768 DDE1     01020         POP     IX
776A E1       01030         POP     HL
776B D1       01040         POP     DE
776C C1       01050         POP     BC
776D F1       01060         POP     AF
              01070 ;
              01080 ;RE-ENABLE AND DONE
776E ED56     01090         IM      1
7770 FB       01100         EI
7771 C9       01110         RET
              01120 ;
              01130 ;HOUSEKEEPING BYTES
              01130 ;HOUSEKEEPING BYTES
7772 01       01140 RCNT    DEFB    1
7773 00       01150 RFIN1   DEFB    0
7774 00       01160 RFIN2   DEFB    0
7775 00       01170 RFIN3   DEFB    0
7776 00       01180 RFIN4   DEFB    0
              01190 ;SP2-4 ARE POSITIONED SO REG'S ARE POPPED FIRST.
7777 FF       01200 SP1     DEFB    0FFH
7778 43       01210         DEFB    43H
7779 F2       01220 SP2     DEFB    0F2H
777A 44       01230         DEFB    44H
777B F2       01240 SP3     DEFB    0F2H
777C 45       01250         DEFB    45H
777D F2       01260 SP4     DEFB    0F2H
777E 46       01270         DEFB    46H
7780          01280         END     START
00000 TOTAL ERRORS
              00100 ;************************************************
              00110 ;***                PROGRAM #1                ***
              00120 ;************************************************
4700          00130         ORG     4700H
7773          00140 RFIN1   EQU     7773H           ;TIE TO INT ROUTINE
4700 213C03   00150 START   LD      HL,3C00H        ;CLEAR THE SCREEN
4703 1620     00160         LD      D,20H           ;TO BE NEAT
4705 010004   00170         LD      BC,400H
4708 72       00180 CLEAR   LD      (HL),D
4709 23       00190         INC     HL
470A 0B       00200         DEC     BC
470B 78       00210         LD      A,B
470C B1       00220         OR      C
470D 20F9     00230         JR      NZ,CLEAR
470F FB       00240         EI                      ;ENABLE INT
4710 215D47   00250         LD      HL,STRG1        ;PUT MESSAGE TO
4713 11403C   00260         LD      DE,3C40H        ;SCREEN
4716 010E00   00270         LD      BC,0EH
4719 EDB0     00280         LDIR
471B 13       00290         INC     DE
471C 010000   00300         LD      BC,0
471F 3E81     00310 PUT     LD      A,81H           ;MOVE A GRAPHICS
4721 12       00320 PUT1    LD      (DE),A          ;CELL AROUND
4722 CD4D47   00330         CALL    DELAY
4725 3C       00340         INC     A
4726 FEC0     00350         CP      0C0H
4728 C22147   00360         JP      NZ,PUT1
472B 0C       00370         INC     C
472C 79       00380         LD      A,C
472D FEFF     00390         CP      0FFH
472F 0E00     00400         LD      C,0
4731 04       00410         INC     B
4732 78       00420         LD      A,B
4733 FEFF     00430         CP      0FFH
4735 20E8     00440         JR      NZ,PUT
4737 3E31     00450         LD      A,31H
4739 12       00460         LD      (DE),A
473A 11523C   00470         LD      DE,3C52H
473D 010800   00480         LD      BC,8
4740 216B47   00490         LD      HL,STRG2        ; PUT 'FINISHED'
4743 EDB0     00500         LDIR                    ;ON THE SCREEN
4745 3E01     00510         LD      A,1             ;TELL INT ROUTINE
4747 327377   00520         LD      (RFIN1),A       ;PROGRAM FINISHED
474A C34A47   00530 LOOP    JP      LOOP            ;LOOP HERE WHEN DONE
474D C5       00540 DELAY   PUSH    BC              ;DELAY SUBROUTINE
474E F5       00550         PUSH    AF
474F 3E02     00560         LD      A,2
4751 010A00   00570 DEL     LD      BC,0AH
4754 0D       00580 DEL1    DEC     C
4755 20FD     00590         JR      NZ,DEL1
4757 3D       00600         DEC     A
```

Program continues

Program continued

```
4758 20F7      00610          JR      NZ,DEL
475A F1        00620          POP     AF
475B C1        00630          POP     BC
475C C9        00640          RET
475D 50        00650 STRG1    DEFM    'PROGRAM #1 -->';THE MESSAGES
476B 46        00660 STRG2    DEFM    'FINISHED'
4780           00670          END     START

               00100 ;*************************************************
               00110 ;***                PROGRAM #2                 ***
               00120 ;*************************************************
5300           00130          ORG     5300H
7774           00140 RFIN2    EQU     7774H           ;TIE TO INT ROUTINE
5300 214C53    00150 START    LD      HL,STRG1        ;PUT MESSAGE TO
5303 113D3C    00160          LD      DE,3D00H        ;SCREEN
5306 010E00    00170          LD      BC,0EH
5309 EDB0      00180          LDIR
530B 13        00190          INC     DE
530C 010000    00200          LD      BC,0
530F 3E01      00210 PUT      LD      A,01H           ;MOVE A GRAPHICS
5311 12        00220 PUT1     LD      (DE),A          ;DOT AROUND
5312 CD3D53    00230          CALL    DELAY
5315 3C        00240          INC     A
5316 FEC0      00250          CP      0C0H
5318 C21153    00260          JP      NZ,PUT1
531B 0C        00270          INC     C
531C 79        00280          LD      A,C
531D FEFF      00290          CP      0FFH
531F 0E00      00300          LD      C,0
5321 04        00310          INC     B
5322 78        00320          LD      A,B
5323 FEFF      00330          CP      0FFH
5325 20E8      00340          JR      NZ,PUT
5327 3E32      00350          LD      A,32H
5329 12        00360          LD      (DE),A
532A 11123D    00370          LD      DE,3D12H
532D 010000    00380          LD      BC,0
5330 215A53    00390          LD      HL,STRG2        ;WRITE 'FINISHED'
5333 EDB0      00400          LDIR
5335 3E01      00410          LD      A,1             ;TELL INT THE
5337 327477    00420          LD      (RFIN2),A       ;PROGRAM FINISHED
533A C33A53    00430 LOOP     JP      LOOP            ;LOOP HERE WHEN DONE
533D C5        00440 DELAY    PUSH    BC              ;DELAY SUBROUTINE
533E F5        00450          PUSH    AF
533F 3E02      00460          LD      A,2
5341 0E00      00470 DEL      LD      C,0
5343 0D        00480 DEL1     DEC     C
5344 20FD      00490          JR      NZ,DEL1
5346 3D        00500          DEC     A
5347 20F8      00510          JR      NZ,DEL
5349 F1        00520          POP     AF
534A C1        00530          POP     BC
534B C9        00540          RET
534C 50        00550 STRG1    DEFM    'PROGRAM #2 -->';THE MESSAGES
535A 46        00560 STRG2    DEFM    'FINISHED'
5300           00570          END     START

               00100 ;*****************************************
********
               00110 ;***                PROGRAM #3
   ***
               00120 ;*****************************************
********
5F00           00130          ORG     5F00H
7775           00140 RFIN3    EQU     7775H           ;TIE TO INT
ROUTINE
5F00 214C5F    00150 START    LD      HL,STRG1        ;PUT MESSAGE
 TO
5F03 113D3D    00160          LD      DE,3DC0H        ;THE SCREEN
5F06 010E00    00170          LD      BC,0EH
5F09 EDB0      00180          LDIR
5F0B 13        00190          INC     DE
5F0C 010000    00200          LD      BC,0
5F0F 3E01      00210 PUT      LD      A,01H           ;MOVE A GRAP
HICS
5F11 12        00220 PUT1     LD      (DE),A          ;DOT AROUND
5F12 CD3D5F    00230          CALL    DELAY
5F15 3C        00240          INC     A
5F16 FEC0      00250          CP      0C0H
5F18 C2115F    00260          JP      NZ,PUT1
5F1B 0C        00270          INC     C
5F1C 79        00280          LD      A,C
5F1D FEFF      00290          CP      0FFH
5F1F 0E00      00300          LD      C,0
5F21 04        00310          INC     B
5F22 78        00320          LD      A,B
5F23 FEFF      00330          CP      0FFH
5F25 20E8      00340          JR      NZ,PUT
5F27 3E33      00350          LD      A,33H
5F29 12        00360          LD      (DE),A
5F2A 11D23D    00370          LD      DE,3DD2H
5F2D 010000    00380          LD      BC,0
5F30 215A5F    00390          LD      HL,STRG2        ;WRITE 'FINI
SHED'
5F33 EDB0      00400          LDIR
5F35 3E01      00410          LD      A,1             ;TELL INT RO
UTINE
5F37 327577    00420          LD      (RFIN3),A       ;PROGRAM FIN
ISHED
5F3A C33A5F    00430 LOOP     JP      LOOP            ;LOOP HERE W
HEN DONE
5F3D C5        00440 DELAY    PUSH    BC              ;DELAY SUBRO
UTINE
5F3E F5        00450          PUSH    AF
5F3F 3E02      00460          LD      A,2
5F41 0E30      00470 DEL      LD      C,30H
5F43 0D        00480 DEL1     DEC     C
5F44 20FD      00490          JR      NZ,DEL1
5F46 3D        00500          DEC     A
5F47 20F8      00510          JR      NZ,DEL
5F49 F1        00520          POP     AF
5F4A C1        00530          POP     BC
5F4B C9        00540          RET
5F4C 50        00550 STRG1    DEFM    'PROGRAM #3 -->';THE MESSAGE
S
```

Program continues

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A helpful technique is to add a time clock program to the service routine. All the programs can use this for timing functions.■

Parts List

555 IC Timer
1.0 MEG Potentiometer
150 Ω 5 percent Resistor
1.0 uF Capacitor
.01 uF Capacitor

Table 3. Parts List

Program continued

```
                    5F5A 46       00560 STRG2   DEFM    'FINISHED'
                    5F00          00570         END     START

                    00100 ;*************************************************
                    00110 ;***                PROGRAM #4                 ***
                    00120 ;*************************************************
6B00                00130         ORG     6B00H
7776                00140 RFIN4   EQU     7776H          ;TIE TO INT ROUTINE
6B00 214C6B         00150 START   LD      HL,STRG1       ;PUT MESSAGE TO
6B03 11803E         00160         LD      DE,3E80H       ;THE SCREEN
6B06 010E00         00170         LD      BC,0EH
6B09 EDB0           00180         LDIR
6B0B 13             00190         INC     DE
6B0C 010000         00200         LD      BC,0
6B0F 3E81           00210 PUT     LD      A,81H          ;MOVE A GRAPHICS
6B11 12             00220 PUT1    LD      (DE),A         ;DOT AROUND
6B12 CD3D6B         00230         CALL    DELAY
6B15 3C             00240         INC     A
6B16 FEC0           00250         CP      0C0H
6B18 C2116B         00260         JP      NZ,PUT1
6B1B 0C             00270         INC     C
6B1C 79             00280         LD      A,C
6B1D FEFF           00290         CP      0FFH
6B1F 0E00           00300         LD      C,0
6B21 04             00310         INC     B
6B22 78             00320         LD      A,B
6B23 FEFF           00330         CP      0FFH
6B25 20E8           00340         JR      NZ,PUT
6B27 3E34           00350         LD      A,34H
6B29 12             00360         LD      (DE),A
6B2A 11923E         00370         LD      DE,3E92H
6B2D 010800         00380         LD      BC,8
6B30 215A6B         00390         LD      HL,STRG2       ;WRITE 'FINISHED'
6B33 EDB0           00400         LDIR
6B35 3E01           00410         LD      A,1            ;TELL INT ROUTINE
6B37 327677         00420         LD      (RFIN4),A      ;PROGRAM FINISHED
6B3A C33A6B         00430 LOOP    JP      LOOP           ;LOOP HERE WHEN DONE
6B3D C5             00440 DELAY   PUSH    BC             ;DELAY SUBROUTINE
6B3E F5             00450         PUSH    AF
6B3F 3E02           00460         LD      A,2
6B41 0E10           00470 DEL     LD      C,10H
6B43 0D             00480 DEL1    DEC     C
6B44 20FD           00490         JR      NZ,DEL1
6B46 3D             00500         DEC     A
6B47 20F8           00510         JR      NZ,DEL
6B49 F1             00520         POP     AF
6B4A C1             00530         POP     BC
6B4B C9             00540         RET
6B4C 50             00550 STRG1   DEFM    'PROGRAM #4 -->';THE MESSAGES
6B5A 46             00560 STRG2   DEFM    'FINISHED'
6B00                00570         END     START
00000 TOTAL ERRORS
```

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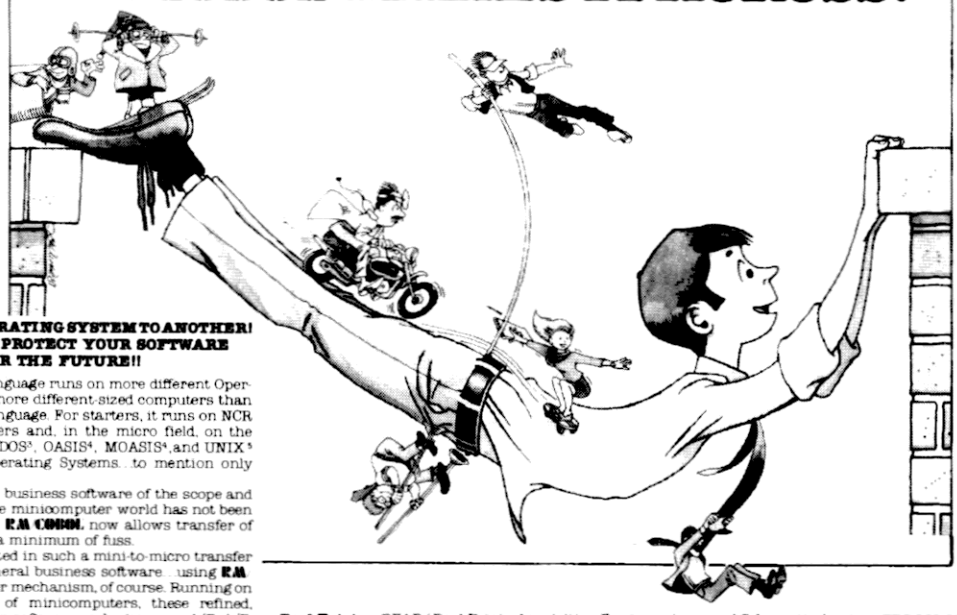

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Open up that cassette input window and let your programs in.

Those CLOAD Blues

Don Hartjes
713 Dodge Street
Kewaunee, WI 54216

I bought my 4K Level I TRS-80 in March of 1980. A few months later I decided to upgrade to Level II. With Level II, I started to collect a lot of software from various sources and that's when the CLOAD blues started. Before then I never had too much trouble loading tapes until I learned that Microchess 1.5 wanted a volume setting of about six while everything else was happy at four and one half.

Loading Problems

The loading problem I encountered appears to stem from two sources, poor quality recordings and Radio Shack's cassette input window. The window acts as a pulse height discriminator i.e., any data with an amplitude above or below it will be lost. With my oscilloscope I watched the data stream on several tapes that were particularly troublesome and was amazed that the amplitude variance was as much as 1.5 volts peak to peak. This is a large error when you stop to consider that the suggested input is 2 volts peak to peak.

The best way I know of to clean up trashy digital signals is to run them through a Schmidt trigger. A Cmos device would have been ideal but since the only thing I had handy was a SN74LS14N TTL hex Schmidt trigger I designed my circuit around it. A bothersome problem with TTL is the fact that its input impedance leaves something to be desired and by itself would snub the recorder. My circuit is simple and straightforward. I used a 2N4220 J-FET to provide the necessary high input impedance to the recorder followed by a 2N5307 Darlington transistor to provide enough current to drive the Schmidt trigger.

The final circuit is pictured ir

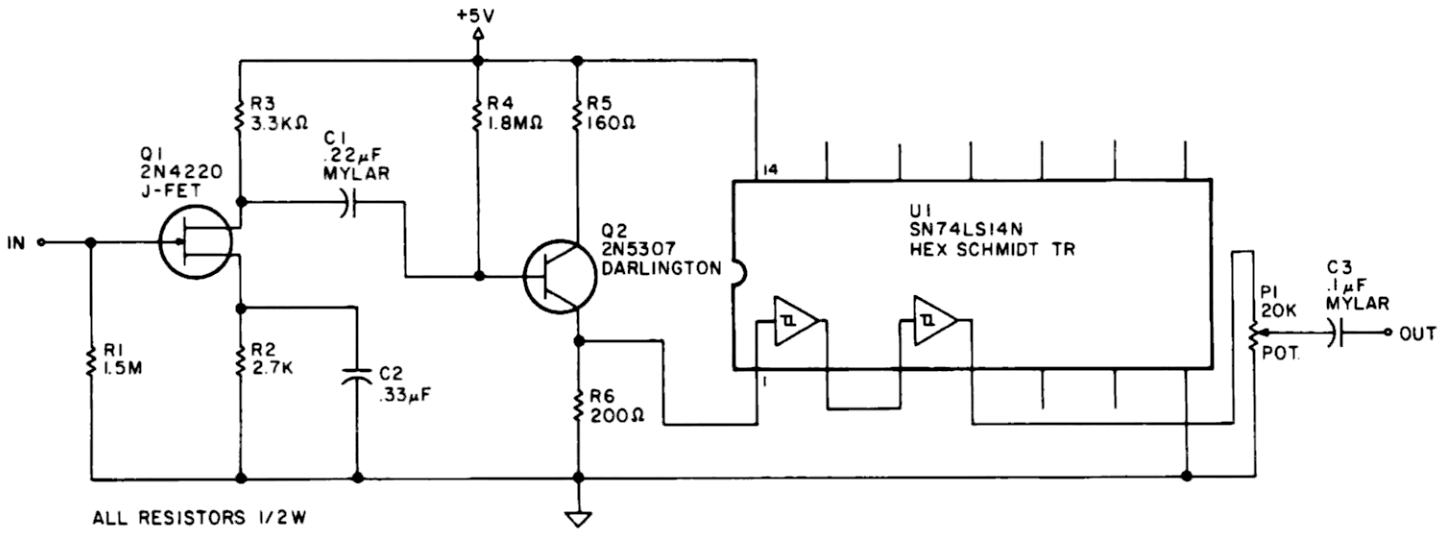


Fig. 1. Data Compensator

Fig. 1 and requires only one adjustment upon completion. All parts mount on a printed circuit board approximately 2" by 3". I mounted the board inside a plastic box that I had purchased for one of my previous projects. Input is via a miniature phono plug and output is through a mating phono jack. The plug goes into the auxiliary hole and the black plug that is removed to accomplish the preceding goes into the jack on the Data Compensator.

After hooking everything up and checking for errors, I started a tape and adjusted P1 for 2.25 volts peak to peak on my oscilloscope. I haven't had a bad load since. If you don't have an oscilloscope load the tape and adjust P1 until the asterisks start to flash, and you're home free.

Sound

While admiring my handiwork I noticed some extra room in the plastic box used to enclosed it. Now that my Alien Invasions tape loaded my kids demanded sound effects, so I decided to put that extra space to work by building an amplifier. The primary design criterion for this amplifier was that it work with the same power supply used by the Data Compensator. Radio Shack sells a one chip audio amplifier for $1. Refer to Fig. 2, and you'll notice that the only other parts needed are two capacitors, one resistor and a speaker. The beauty of this amplifier is its low power consumption and almost perfect volume without any volume control. This circuit is mounted on a 2" by 2" circuit board and snuggles in next to the Data Compensator. The speaker mounts on the removable top of the enclosure.

The current drain of the Data Compensator is almost constant at 19 milliamps whether handling data or idling. With this and the audio amplifier connected and making noise the current drain averaged 30 milliamps. My setup uses a variable power supply which I built long ago to pursue my hobby. Other possibilities for power supplies include four nicad batteries in series, or one of the many regulator chips available. Or, while you're at Radio Shack you could buy one of their project s. The options are endless but I would advise caution. TTL circuitry is fussy about its power supply. Specification sheets call for 4.5 volts minimum and 5.5 volts maximum. Keep it well filtered and well regulated.

My total cash outlay for this project, using parts in my stock where possible, was about $5. If most of the parts are purchased it should be within reach of a twenty dollar bill.■

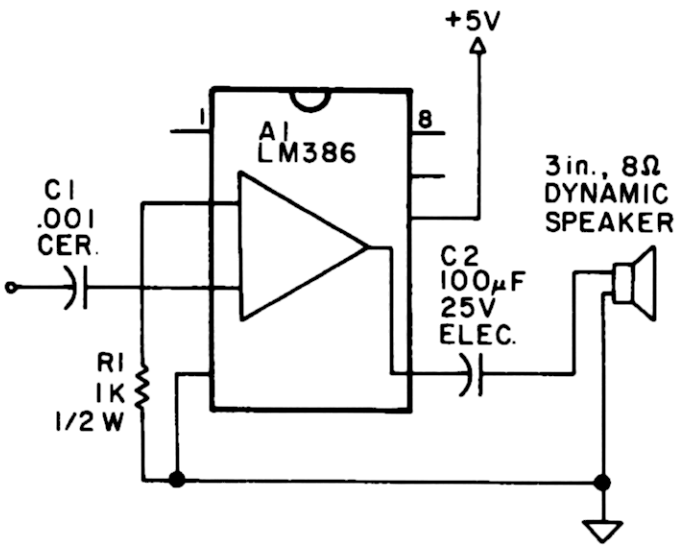
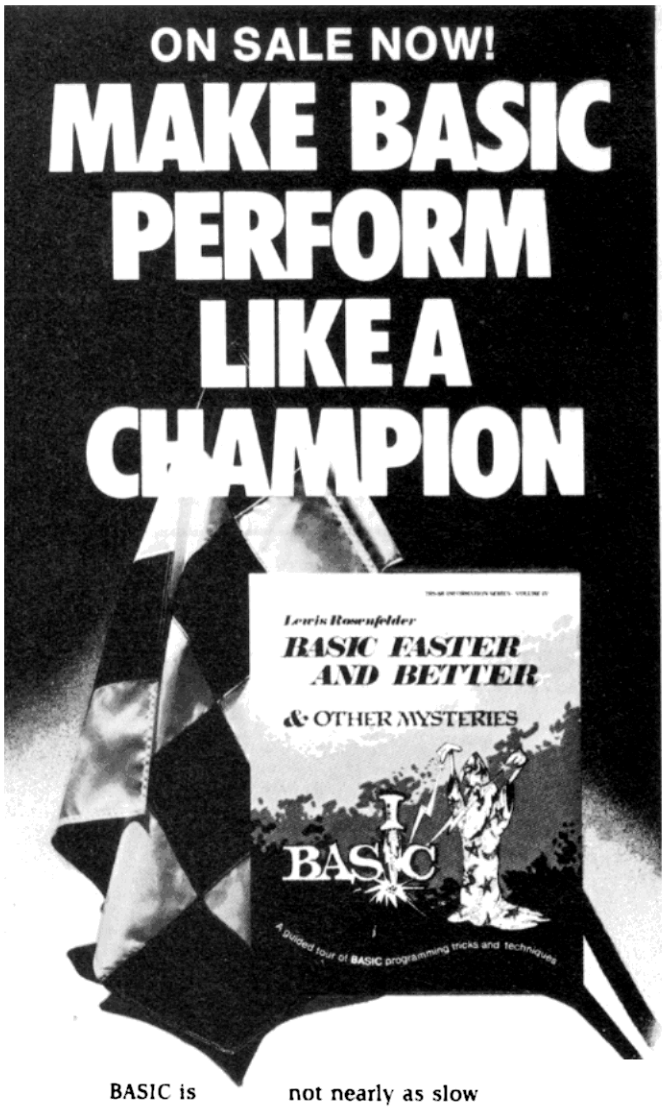


Fig. 2. Audio Amplifier



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Learn to use the Basic function Print Using.

Using Print Using

Chris Rende
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The TRS-80 has become the world's most popular microcomputer. This is due to Tandy/Radio Shack and to Microsoft for the greatest representation of the Basic language ever assembled into one computer. Microsoft's Basic (on the TRS-80) is complete right down to the precise formatted output.

The Print Using capabilities on the TRS-80 are also quite complete as far as other Basic commands go. So why don't more people take advantage of this powerful tool? Perhaps they don't know how in the world all of those number and dollar signs can be transformed into a nice clean output.

Let's examine the Print Using functions and characters more closely than Radio Shack's manual does. I suggest that you sit down with your computer while you read through this article. Then, you can type in the examples, see how they run for yourself, and also experiment on your own.

The format for the Print Using statement is:

```
XXXX Print Using string; variables
Where
XXXX is any line number (or calculator mode)
string is any valid string (something in quotes or in a variable.)
variables is any list of variables to be outputted.
```

Two types of data can be outputted in this manner: numbers and characters. We will start with numbers.

When a Print Using statement is used the computer takes your variables or constants and arranges them in accordance with your string. Type this into your computer: PRINT "TEST";1;"TEST".

What you get is: TESTb1b TEST (where b means a space). But what if you want to type out data without spaces? You resort to Print Using of course. Try this: Print Using "TEST# TEST";1. Now you get TEST1TEST. What happened was that the computer took the 1 and scanned through the string supplied till it found the key character #. It promptly took the 1 and stuck it in the #'s place and output the new string . . . with no spaces.

So, for each # in a string, the computer looks for one digit to put in its place. If there are not enough digits in the output number, the computer puts blanks on the left to fill the space. For example:

```
PRINT "TEST";1;"TEST"
is equivalent to
PRINT USING "TEST## TEST";1
```

If the number of digits in a number exceeds the number of #'s, then the complete number is outputted with a leading % sign.

```
PRINT USING "###";12345 yields
%12345 on the screen.
```

The next Print Using string character we will explore is a decimal point (.). You use this to output non-integer numbers. If you tried to print 3.1415 with a Print Using string of "##", you would see b3 because you have no provision for a decimal point in your string. However, if you use a string of "#.####", you would see 3.1415.

The decimal point in the string tells the computer that there will be digits on the right of the supplied decimal point. If you have more # signs than digits then the extra # signs on the right become zeros. If you have more digits than signs on the right of the point the computer rounds the last digit replacing the last # sign to the nearest number with respect to the chopped off digits' size. (Confusing to write but easy to see . . .)

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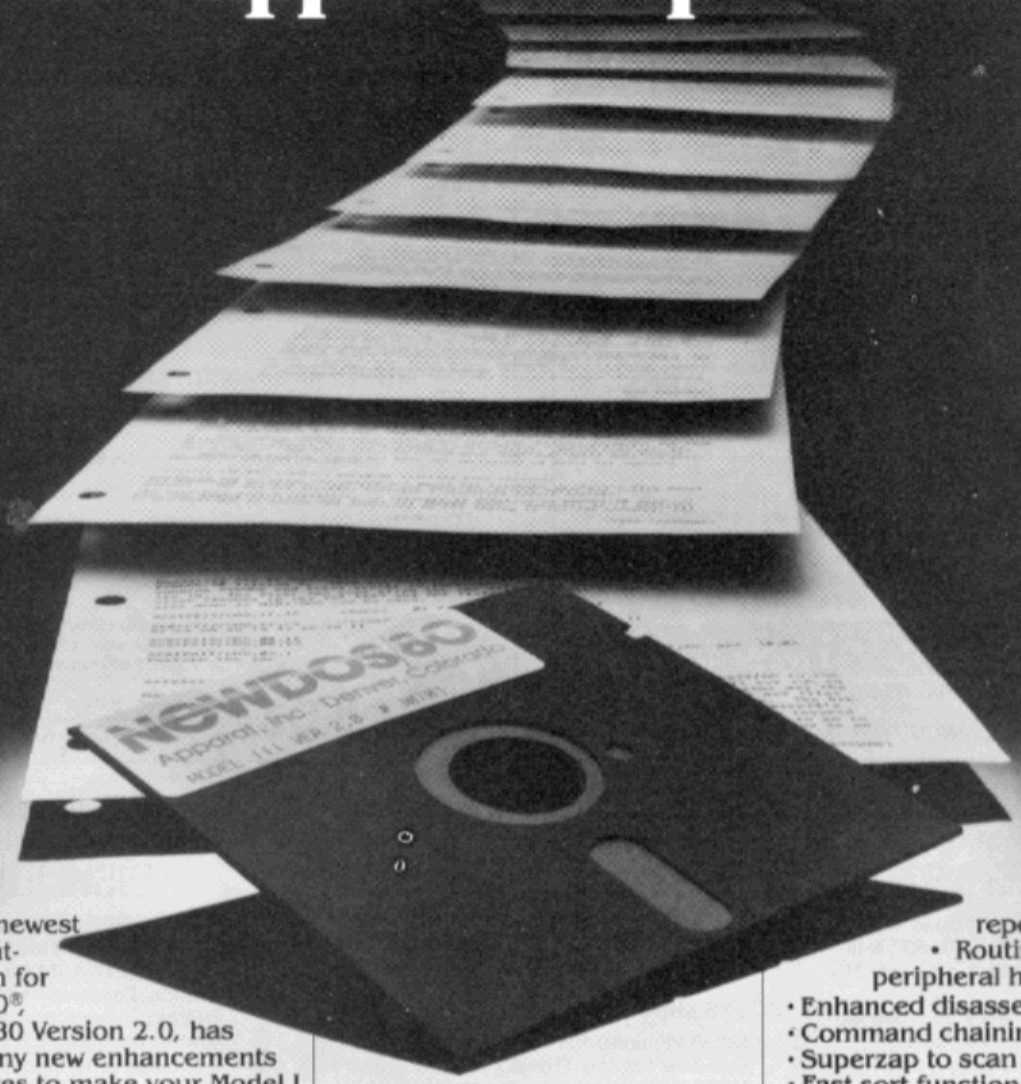

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```
PRINT USING "#.####";3.141592
yields 3.1416 because of the 9
PRINT USING "#.#";3.141592 yields 3.1
```

The next key character is the *. This is used to print stars on the left of an outputted number. (For canceling out decimal places on the left of a dollar amount; checks and the like).

```
PRINT USING "**####";1 yields
******1
(Notice that the Stars MUST be doubled.)
PRINT USING "**";33 yields 33
```

Similar to star, the $ sign can be used in the same way.

```
PRINT USING "$$##";1 yields bb$1
PRINT USING "$$";33 yields %$33
```

Note that the * and $ modes are only activated when there are two of them next to each other and they are the first two characters in the output string.

One more key string for the fancy accounting look is two stars followed by a dollar sign. (**$).

```
PRINT USING "**$##";1 yields ***$1
PRINT USING "**$";3 yields **$3
PRINT USING "**$";33 yields $33
PRINT USING "**$";333 yields % $333
```

The stars fill up all unused places to the left minus one place which is reserved for the dollar sign.

Microsoft also gave us provisions for outputting signed numbers. There is a leading and trailing plus sign (+) code and a trailing negative sign (−) code.

Whenever a plus sign is the first character in the output string or the last, the sign of the outputted number or variable is also printed on the same side of the number as the plus sign.

```
PRINT USING "+##";3 yields b+3
PRINT USING "##+";3 yields b3+
PRINT USING "+##";−3 yields b−3
PRINT USING "##+";−3 yields b3−
```

The negative sign (trailing) prints a negative sign if the output data is negative else it prints a blank, not a plus sign.

```
PRINT USING "##−";3 yields b3b
PRINT USING "##−";−3 yields b3−
```

That concludes the codes for controlling the output of numbers. Now let's look at strings. There are only two special characters recognized by the computer for string print using statements. One is the percent sign (%) and the other is the exclamation mark (!).

The percent sign marks the beginning and then the end of a print location to be filled with string data. Between the two percent signs is a certain number of spaces; these spaces define the width of the string field. For example, the expression "%bb%" defines a string field of four positions. (The beginning and end percent signs count as one space each.) When you use this print mode the computer takes the operand string supplied by you and tries to put it into the Print Using field. For example:

```
PRINT USING "%bb%"; "ABCD" yields
ABCD
PRINT USING "%b%";"ABCD" yields
ABC
```

All characters that don't fit into the Print Using statement are cut off, as in the second example above. Any percent sign that is not beginning or ending a string field is regarded as just another character.

```
PRINT USING "OVER 10% OF FUNDS.
% b%";"ABCDE" yields OVER 10% OF
FUNDS. ABC
```

The other string key character is used to take the first character out of a string and print it.

```
PRINT USING "!";"ABC" yields A
PRINT USING"!!";"AB", "CD" yields AC
```

As it (the !) is used in the Level II manual, the ! is excellent for extracting initials from a person's name.

```
PRINT USING "!. !."; "BILL", "ALLEN"
yields B. A.
```

Another handy feature of the numeric Print Using mode is the comma. When you place a comma inside a string of number signs, the computer outputs the number with commas every three decimal places.

```
PRINT USING "#####,##";3E5 yields 300,000
```

There you have it! The complete lowdown on TRS-80 Print Using statement.■

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When Percom initially released their double density board for the TRS-80 Model I, a number of uncertainties and potential problems occurred to me. Primarily, would my 1978 Shugart SA-400 drives support double density on my 1978 TRS-80 with buffered cable, twisted pair connector (between CPU board and expansion interface) and souped-up CPU clock?

According to Percom, original Shugarts and Radio Shack Shugarts which have serial numbers greater than 80,000 or which contain an alphabetic character are double-density rated. The serial number can be found on the belt and pulley side of the drive (remove the cover) on a silver metallic sticker. Three of my late 1978 drives start with the letter A and the fourth had a serial number in the 64,000 range. By Percom's criteria, three of my four drives are DD rated.

For owners of Shugart and Radio Shack Shugart drives, it would probably be worth your while to verify the drives as DD capable. Users who are uncertain about other brand drives may also want to call Percom.

Having assured myself that my TRS-80 had the potential for double density (DD) operations, a number of additional questions still plagued me. For instance: What were the qualifications of DBLDOS (Double Density DOS) provided by Percom to purchasers of their Doubler? Could DBLDOS satisfy my operational needs, or would it be preferable to purchase Double Zap II (Circle J Software) to convert my NEWDOS/80 to double density capability? Would all of my single density disks have to be converted to DD format before being usable on the modified system? (That could be a *BIG* undertaking.) Would conversion of my TRS-80 to double density introduce software incompatibilities with other single density TRS-80s? Is the Doubler easy to install?

The Percom Doubler and DBLDOS

The Percom Doubler Board is relatively small, measuring roughly 3 by 4 inches. Installation is easy and requires no trace cutting or soldering. Simply remove the bottom of the TRS-80 expansion interface, remove the floppy disk controller (FDC) chip, install it in the blank FDC socket on the Doubler board, and install the Doubler into the expansion interface socket left empty by the FDC chip removal.

For the experienced hardware hacker this is a very simple procedure, but many readers have never attempted minor surgery of any sort on their microcomputers. Percom provides easy-to-follow installation instructions with the Doubler but in consideration for the inexperienced, here are a few pointers.

Keep in mind that installation of any foreign hardware items into a TRS-80 voids its warranty or may result in higher service charges by Radio Shack after the warranty has expired.

The FDC chip is the largest chip on the expansion interface board. Its identification numbers are 1771, with variations of alpha prefixes and suffixes.

FDC and other large 40-pin chips are subject to damage from careless installation and removal simply by virtue of their size; be careful. Static electricity, especially high in homes during winter months is fatal to chips of this type. If you do not know how to remove the large 40-pin FDC chip or if you do not know how to protect it from static discharge damage during handling, get help.

The Doubler board has another FDC chip (a double density 1791) that is subject to the same precautions. It is not necessary to remove the 1791 chip from its Doubler socket during installation, but the old 1771 chip must be inserted into a vacant socket provided on the Doubler board.

The Doubler has 40 sturdy pins on its underside which must be pressed into the expansion interface FDC socket made vacant by the 1771 removal. Visibility is a bit restricted during this phase of the Doubler board installation, so make sure your lighting is good and the pins are *aligned perfectly* with the socket receptacles.

After installation of the Doubler, power up your system and it should function as before. Note that your TRS-80 is still operating in single density mode; from here on things will be pretty much automatic.

The next important step is to make a backup of the Percom DBLDOS, following the backup instructions provided by Percom. The procedure is not significantly different from other disk backups.

Percom DBLDOS appears to be a combination of NEWDOS 2.1 and TRSDOS 2.3. It has seven System files, plus two

new files called DOUBLE/CMD and FRMT/ CMD which were developed for double density formating and copy operations.

If you are a contented TRSDOS user and have no need for the other fancy DOS systems, Percom's DBLDOS seems to be equivalent to TRSDOS 2.3. The approximate cost of $169.95 for the Doubler with its DBLDOS can be all the money you need to spend to convert to DD operation.

NEWDOS/80 and VTOS 4.0

If you have the requirement (and the money) for a more sophisticated DD Disk Operating System, NEWDOS/80 or VTOS 4.0 will function in DD, but not without being substantially modified with the appropriate Double Zap II.

Apparat does not advertise their NEWDOS/80 as DD capable. VTOS 4.0 advertises DD support, but it is not addressed in the VTOS 4.0 documentation. Both require Double Zap II for DD operation.

Which DOS is better is a matter of opinion and a function of the user's specific needs. Because I do not have Double Zap II for VTOS 4.0, its suitability for DD operations will not be addressed in this article. The following paragraphs address only NEWDOS/80 as modified for DD operations by Double Zap II.

NEWDOS/80 + DOUBLE ZAP II

For approximately $50, Double Zap II comes on a single density, non-copy protected disk (an important consideration these days, but not an open invitation for piracy), and is equipped with seven files for patching and using NEWDOS/80 in DD.

The files used for patching NEWDOS/80 do not require Apparat's Superzap as might be expected. Rather, the majority of the patching operation is automated by Chain files which do most of the work. Even if you are not familiar with the NEWDOS/80 Chain function, the Double Zap II documentation is extremely well written and clear.

A special file is provided for double density formatting. It works much like the NEWDOS/80 Format function and accepts the same unique N80 commands such as CBF (Copy By File), NDMW (No Disk Mount Wait), UBB (Use Big Buffer), and so on.

Another special file, ADR/CMD (Automatic Density Recognition), is a surprisingly short file which automatically allows two or more disk drives to function in mixed single and double density mode. For example, with the DD NEWDOS/80 in drive zero and a single density disk in drive one, it is possible to copy a double density file from drive zero to drive one, or a single density file from drive one to drive zero. Programs can also be executed from any single or double density disk. These functions are completely automatic and can be accomplished without any special input from the user.

Software Compatibility

Known program incompatibilities include Super Utility (Breeze Software) and the disk input/output functions in RSM2D (Small Systems Software). All other functions of RSM2D work normally.

The user should also keep in mind the information provided in the Double Zap II documentation on page 15: If a program does not honor HIMEM (stored in 4049 hex), it cannot function reliably in mixed double-single density mode because ADR/CMD, situated in high RAM, is likely to get clobbered. A known candidate for this problem is Radio Shack's Profile. The same documentation adds that Visicalc's use of HIMEM is "unknown," so use it in mixed DD/SD mode with caution. This does not adversely affect the use of Visicalc in straight double density mode.

Another minor problem involves the Double Zap II method of locating directory tracks. On the System disk (NEWDOS/80 in drive zero) the directory will be on the traditional track eleven hex, but on data disks (containing no system files except for Boot/SYS and DIR/SYS) the directory is placed on track 1C hex. Disk file and directory access is more efficient if the directory is located at or near the middle disk track.

NEWDOS/80 can function with up to three directory tracks located anywhere on the disk. Problems can develop when certain machine language programs insist on looking for the directory on track eleven hex only. Pencil is one of these: It will not read a directory located on any track other than eleven hex. Writing Pencil files is not a problem because Pencil allows the DOS to figure out where the directory track is.

Patching the Problem

Rather than experiment to locate other incompatible machine language programs, I chose to eliminate the problem with a patch to the DBLFMT/CMD file (the Double Zap II file that performs double density formatting and copying) to always put the directory on track eleven hex, regardless of whether the disk is used as a system or data disk. This approach works fine; there appears to be no excessive amount of disk head movement as a consequence (see Table 1). Other than these few exceptions, most machine language programs work fine and I have not yet encountered any Basic program incompatibilities. The reader is nevertheless cautioned on the use of Basic programs that POKE machine language from data statements into high memory when ADR/CMD is up there. Although Apparat's Basic version of Superzap POKEs machine language into RAM, it works fine with either NEWDOS/80 or Percom's DBLDOS.

So far I have successfully used in double density mode RSM2D (minus the disk I/O functions), Pencil (with the DBLFMT/CMD fix described in the preceding paragraph), Scripsit, ST80D (by Lance Micklus), Microsoft's Macro Assembler, EDTASM (both Apparat's disk version and the improved version by Roy Soltoff), Visicalc, most game programs written in either machine language or Basic, and so on. In short, most well-written

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software appear to suffer no ill consequences when operating in double density.

Problem Areas

Perhaps the biggest frustration for a few DD users is the disk format problem encountered at the inner tracks. This DD format problem is similar to the one that materialized in single density when some manufacturers started to market their 40 (and now 80) track drives: The inner five tracks were often difficult to format. In response to this single density format problem, Percom developed and marketed a Data Separator for single density TRS-80s.

Although Percom designed an integral data separator into their double density board, some drives still have difficulty formatting the inner tracks.

Percom's DBLDOS appears to successfully format a disk on the first pass virtually every time, whereas NEWDOS/80, as modified with Double Zap II, frequently fails at the inner tracks. Why should this be so?

Percom uses the traditional single density 'E5' byte pattern for disk fomatting, whereas Double Zap II uses an alternating byte pair of '6D B6'. A spokesman for Circle J Software explains that the 'E5' is a "worst case" pattern for single density formatting, but the '6D B6' byte pattern was selected as the worst case for double density formatting. A worst case formatting pattern is used to flush out marginal disk tracks which might otherwise sneak through and cause problems later.

Some solutions for inner disk track formatting problems are suggested in Table 1 courtesy of Circle Software. Note the caution on replacing the '6D B6' DD formatting pattern with the 'E5'; converting to an 'E5' pattern will make it easier to format, but you will lose the benefit of forcing a worst case situation to the disk and perhaps allow a marginal track to pass the format verification.

It is my opinion, however, that if the 'E5' is used in DD formatting, the risk of incurring disk I/O errors during operational use is probably small. The DOS error logic will detect a subsequent write problem and flag the error. Once a disk write is successfully accomplished, chances are good that subsequent reads will verify as well. The 'E5' formatting pattern in DD would be my choice if it came down to not being able to use the last five tracks on a forty track drive unless, of course, disk I/O problems developed as a consequence.

Another solution might be to switch to a more expensive disk rated for double density use (although I have not had to resort to either measure with my 35 track drives). So far, I have had no problems with ordinary Verbatims, Dysans, and Plain Jane disks (marketed by Meta Technologies Corp). Users of 40, 77 or 80 track drives might not be so fortunate, but experiment to find out what works best on your TRS-80 system.

DD Disk Formatting and File Allocation

The formatting scheme and file allocation performed by DD NEWDOS/80 can, upon first exposure, be confusing. It is not mandatory that the user understand how disk formatting and file management is accomplished, but it is useful information to have available. Being able to solve minor problems by yourself can save a lot of wasted time and phone calls.

The TRS-80 ROM demands a Boot/SYS on drive zero, track zero, sector zero. This Boot/SYS file occupies only one sector (although a full gran is allocated to it) and it must be in single density format. After the boot is executed by ROM, it resumes file loading where the ROM left off. This holds true even for copy-protected disks. Consequently, both DBLDOS and Double Zap II format the entire physical track zero in single density. The unused nine single density sectors on physical track zero are wasted, but this is virtually a matter of necessity.

The remaining double density tracks and sectors are managed by way of "pseudo" tracks and sectors *rather than* "*physical*" tracks and sectors.

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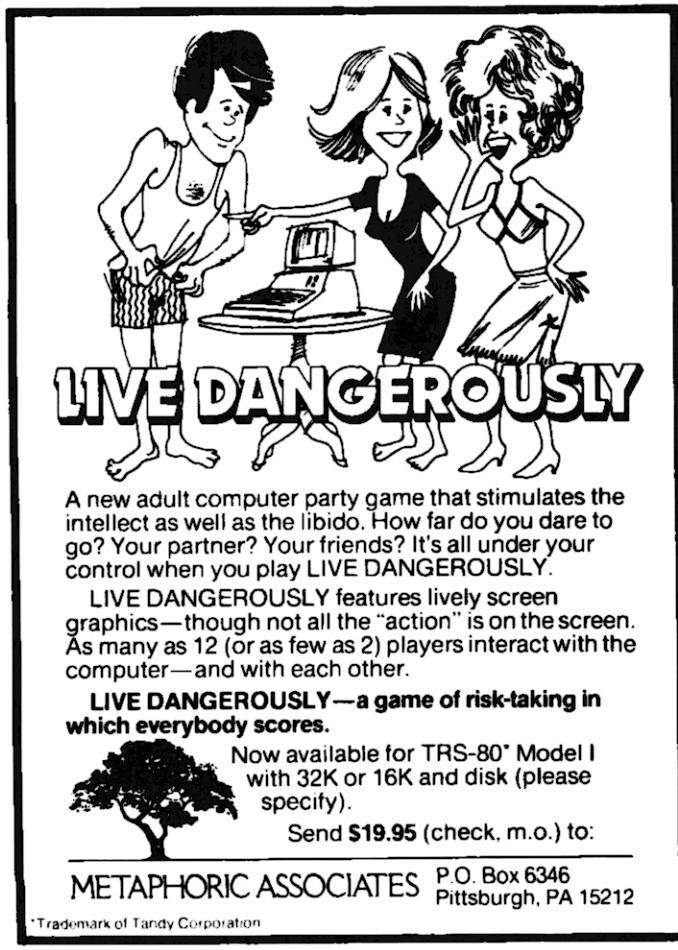

zap is used in double density mode to read the sectors on the DD NEWDOS/80 track zero. To the user and to Superzap, track zero will be identified as such and even the Boot/SYS file will be found in its usual position on what looks like track zero, sector zero. But what you and Superzap are looking at is "pseudo" track zero which is actually "physical" track one; the DOS system in DD mode is not aware of the existence of the single density physical track zero.

The usual ten sectors per track scheme is retained in DD mode for file allocation and disk space management, this in spite of the fact that each physical DD track contains eighteen physical DD sectors.

Let's have a look at just one track to help clarify things a bit. Physical track one is seen by the DD DOS as a "pseudo" track zero. Physical sectors zero to nine (a total of 10 sectors) make up the usual two grans (five sectors per gran); on pseudo track zero these first ten physical sectors happen to correspond to the same pseudo sector numbers. Continuing along pseudo

Table 1

All Zaps are presented in the usual Superzap format. Example: 10/B9 indicates the file's relative sector, relative byte, in hex, not decimal.

A. Percom DBLDOS

1. Zaps for using Percom's DBLDOS in a TRS-80 with speedup board installed.

a. Boot/SYS: Important! Zaps to Boot/SYS must be made in single density mode. Boot up your single density DOS and use the single density Superzap for zapping Boot/SYS on physical track zero, sector zero. This will be the only readable track in single density mode.

(00/F0):	41	20	43	4F	4D	50	41	4E
To:	C5	E3	E3	E3	E3	C3	93	42
(00/8F):	37	C5	C1	C5	7E			
To:	37	C3	F0	42	7E			

b. SYS0/SYS,

(01/83):	C3	EF	44	00				
To:	C3	97	4B	00				
(0C/6E):	02	02	00	4E	etc.			
To:	01	09	97	4B	E3	E3	E3	
	E3	C3	EF	44	02	02	00	4E
(03/A9):	E5	E1	E5	E1				
To:	E3	E3	E3	E3				

c. DOUBLE/CMD

(05/D7):	F5	F1	F5	F1					
To:	E3	E3	E3	E3					
(07/4E):	F5	F1	08	32	ED	37	F5	F1	C9
To:	E3	E3	E3	E3	08	32	ED	37	C9

End DBLDOS fast clock Zaps.

B. NEWDOS/80 and Double Zap II

1. Fast clock ZAPs for NEWDOS/80 as modified by Double Zap II:

a. SYS0/SYS,

04/88:	2A	3E	06	3D
to:	2A	3E	08	3D

b. SYS0/SYS,

04/A0:	11	00	24	1B
to:	11	00	36	1B

Use the '36' value if you are using a CPU clock speedup of 50 per cent. If your clock has a 100 percent speedup, use a value of 48. For the latter case, the '48' value may introduce some disk I/O difficulties when operating at the normal 1.77 Mhz clock speed. If this happens, experiment with different values between 24 and 48. For information purposes, this value is used in a timing loop as the DOS looks for the disk index hole to come around. If not found within certain time parameters, a disk error will be displayed, typically "Motor too fast" or ". . . too slow."

Double Zap II Files (As provided for DD NEWDOS/80)

track zero, we encounter physical sector ten and the DD DOS is told that it is now on pseudo track one, pseudo sector zero. Actually, it is on pseudo track zero, physical sector ten, but the DOS is happy with what it is told.

Perhaps the following abbreviated disk map will clarify this scheme a bit further, starting at pseudo track zero pseudo sector zero (Table 2).

Notice the two pseudo tracks consisting of ten sectors each, is actually one physical track consisting of eighteen sectors plus two sectors of the next physical track. As we go further into the disk, things get even messier.

The Double Zap II documentation provides four simple equations to convert back and forth between pseudo and physical track/sectors for the curious user. Arrange them into a simple Basic program and let it figure out the physical-pseudo track and sector relationship for you.

To summarize, the TRS-80 DOS still manages disk space and files in terms of ten sector (= two gran) segments, just as is done by single density TRS-80

a. ADR/CMD.

01/3A:	E3	E3	36	¼d0
to:	E3	E3	E3	E3

(Note: No ill effects experienced here.)

b. DBLFMT/CMD,

04/67:	E3	E3	32	EC	37
to:	E3	E3	E3	E3	00

(No ill effects here either.)

2. ZAPs to cause directory to always be located on pseudo track 11 rather than pseudo track 1C as implemented on data disks. See text for explanation.

a. DBLFMT/CMD,

00/4B:	CD	8B	46
to:	00	00	00
o3/B1:	3A	13	6B
to:	3E	11	00

C. Double Zap II

The following comments and fixes were provided on Micronet by the courtesy of Jesse Bob Overholt, an author of Double Zap II. Quote:

The following ZAPs were developed to improve the performance of DBLFMT. While the first ZAP should be considered mandatory, the second one should be used only as a last resort. It modifies the test pattern written during format to a less severe one that does not truly test the disk. Please note that if you apply ZAP 2 a format without errors is not a guarantee that the disk is flawless! Errors may occur at a later time when data is written on the disk. Apply ZAP 2 *at your own risk!*

***** ZAP 1 Mandatory *****
Apply to DBLFMT/CMD.

- Sector 4, offsett A0
  Change 53 to 5B (May already be changed)
- Sector 6, offset 25
  Change 53 to 5B (May already be changed)
- Sector 6,offset 52
  Change 21 6A to B4 6D (This adds 5 retries to verify reads)
- Sector 10, offset 0C (XX below means any value is OK)

Change	02	02	00	64	XX	XX	XX	XX
to	01	0E	B4	6D	C5	06	05	CD
Change	XX	XX	XX	XX	XX	XX	XX	XX
to	21	6A	28	02	10	F9	C1	C9
Change	XX	XX	XX	XX				
to	02	02	00	64				

- Sector 9, offset 0C (Fix message format)

Change	22	45	4E	54	45	52
to	45	4E	54	45	52	0D

***** ZAP 2 - APPLY AT YOUR OWN RISK! *****
Apply to DBLFMT/CMD.

- Sector 5, offset 72

Change	36	6D	23	36	B6	23
to	36	E5	23	36	E5	23

Jesse Bob Overholt

As a parting comment, I stated in earlier paragraphs that I tried Jesse's Zap II with known marginal disks and have experienced no problems. If it makes the difference of having or not having double density on the inner tracks with 40 track or more drives, give it a try and see how it works on your system.

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DOS systems. Presumably, this scheme was easier to re-program into NEWDOS/80 than re-programming the file management software for eighteen sector tracks and three sector grans. As another consideration, perhaps this scheme was developed to retain compatibility with some existing TRS-80 machine language software.

What do we end up with in terms of additional disk capacity in DD mode?

For a 35-track drive like mine, we get 18 sectors per physical track on 34 physical tracks (remember, physical track zero is wasted), for a total of 612 physical sectors.

This works out to be the equivalent of 10 sectors on 61 pseudo tracks, for a total of 610 sectors or 122 grans. Notice that two sectors are wasted (612 above, minus 610) because the DOS must function in terms of five sector grans. It cannot deal with the two odd sectors.

The first five sectors on pseudo track zero are assigned to the Boot/SYS file even though it is never used for booting up the system. This also holds true for data disks. In other words, these first five sectors are also wasted, just as they are on single density DOS systems. (Note: Percom's DBLDOS is set up differently and these first five sectors (pseudo track zero, sector zero to sector four) are not wasted.)

As usual, ten physical sectors (two grans) are assigned to the directory. Remember, however, NEWDOS/80 allows user definition of up to three directory tracks if desired. On 35 or 40 track drives more than one directory track usually is not necessary, but on 77 or 80 track drives it can become a necessity.

Single density systems have a total of 70 usable grans, whereas DD systems have a total of 122 usable grans. If three grans are subtracted from both totals for the Boot/SYS and DIR/SYS files, the numbers become 67 and 119. The net gain is 52 grans, or 260 sectors in DD format, which works out to about a 78 percent increase in usable disk space; not exactly double, but a respectable and very convenient increase. Having about 78 percent more storage on a disk is a tremendous convenience, especially when several large related files can be kept on one disk side. For example, the Microsoft Basic Computer Library file is so large that it will not fit on the same single density disk side with the BASCOM and Link files. In double density, the three files fit with room to spare.

Consider also the number of extra files that can be kept available on your system disk in drive zero. On mine are all operational files provided with the NEWDOS/80 package, plus Pencil, Scripsit, EDTASM (the Soltoff version), and several additional utility files. It is a significant convenience not to have to find and load other disks when a particular utility is wanted.

Those of you with 40 (or 80) track drives will benefit even more. Saving money on disk purchases is a consideration, but it is secondary to the convenience gained from additional disk capacity.

With this new capability, think of the money you can save by not having to buy the TRS-80 Model III.■

Pseudo Track	Pseudo Sector	Physical Track	Physical Sector
0	0	1	0
0	1	1	1
0	2	1	2
0	3	1	3
0	4	1	4
0	5	1	5
0	6	1	6
0	7	1	7
0	8	1	8
0	9	1	9
1	0	1	10
1	1	1	11
1	2	1	12
1	3	1	13
1	4	1	14
1	5	1	15
1	6	1	17
1	7	2	0
1	8	2	1
1	9	2	2
2	0	2	3

. . . . and so on.

Table 2. Zap Table

Addendum

Product changes and developments occur so rapidly in the microcomputer industry that it is often difficult to keep up. After this article was originally submitted a few months ago to 80 Microcomputing, *virtually every product mentioned therein has gone through evolutionary changes. Consequently, the following comments are provided to help bring readers up to date.*

Percom's Doubler II

Percom, being one of the most progressive and dependable firms in the micro field, became aware of the inner disk track formatting problem mentioned in the preceding article. Their original Doubler was replaced with an improved Doubler II which virtually eliminated formatting problems and substantially improved disk input/output (I/O). Where I originally had occasional difficulty formatting the inner tracks of a 40-track disk with the worst case '6D B6' byte pattern, I can now format the same worst case pattern to 82 tracks on an 80 track drive with the Doubler II, and I can do this with disks that are not rated for double-density use.

For readers who intend to make the move to double density, I suggest that when ordering from distributors other than Percom, they should be absolutely certain that a Doubler II will be shipped rather than an original Doubler. I have no reason to believe that distributors might be attempting to dump old stock, but there are still some unscrupulous dealers out there and it does not hurt to be cautious. And readers will notice that there are still many ads in the micro magazines which mention only the Doubler rather than the Doubler II.

NEWDOS/80 and Double Zap II

In August, 1981, Apparat released an upgrade to NEWDOS/80 called, appropriately, NEWDOS/80 Version 2. This upgrade, among other things, eliminates the need for the Double Zap II supplementary DD software package because the DD capability is built in. Also, my fast clock zaps are not needed because Version 2 supports fast CPU clock modifications. And Version 2 always puts the disk directory on track 11 hex, thus eliminating the problem discussed in my article.

Again, I suggest that buyers of NEWDOS/80 assure themselves that Version 2 will be provided by a dealer rather than the original NEWDOS/80.

VTOS 4.0

To my knowledge, VTOS 4.0 is no longer being marketed; it has been replaced by the equivalent, but substantially modified and improved, LDOS 5.0. Quality Software Distributors and Lobo Drives are the supporting distributors.

Like NEWDOS/80 Version 2, LDOS 5.0 supports DD operations directly, and it too has the capability to function with fast clock CPU systems.

Support for LDOS 5.0 has been absolutely outstanding and it is a DOS well worth looking into. However, readers should be aware that double-density disks created by LDOS 5.0 and NEWDOS/80, both Versions 1 and 2, are not interchangeable. It is nevertheless possible to swap software between LDOS and NEWDOS by doing so with a single-density copy of the target program. The DOS evolution has finally reached a point where a user should decide on one DOS and stick with it exclusively.■

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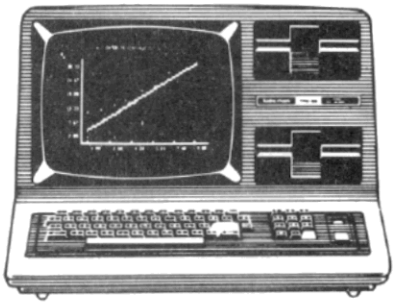

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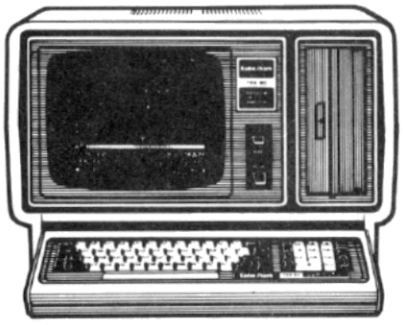

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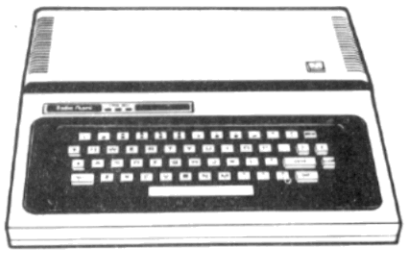

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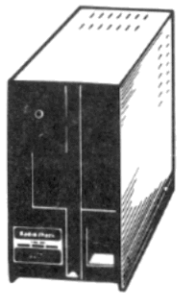

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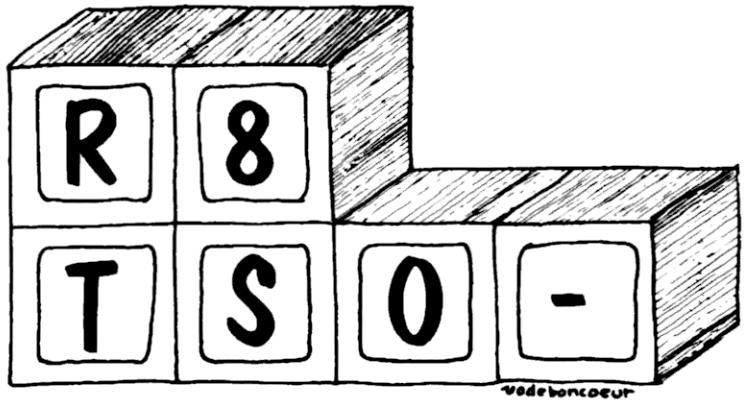

The "fifteen puzzle" consists of a flat box with room for sixteen small blocks arranged in a 4 by 4 grid. In the most common version the box holds 15 numbered blocks and one empty space. The problem is to slide the blocks, vertically or horizontally, until they are arranged in numerical order (see Fig. 1.).

What makes the puzzle interesting is that, once constructed, only half of the possible positions can be reached by sliding the blocks. To make the other half of the positions available the puzzle must be taken apart and reassembled with two of the blocks interchanged. This means that solutions can be asked for which are unobtainable; for example, B can never be reached by sliding the blocks in A (see Fig. 1.).

I have seen versions of these puzzles where the numbers are replaced by letters, and the problem is to assemble a biblical quotation. Another type involved a map of the United States. If you wish to read more about these puzzles and their inventor, Sam Loyd, see Martin Gardner's book *Mathematical Puzzles and Diversions,* which contains a brief account of the origin of the puzzle and a number of references.

Here is a version for the TRS-80 in which the puzzle is scrambled while you watch, ensuring that the starting position remains accessible. To reach a solution, move blocks into the empty space with the arrow keys. I think you will find this much easier than sliding blocks and a good deal of fun! ■

A

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	

B

2	1	3	4
5	6	7	8
9	10	11	12
13	14	15	

Fig. 1. Fifteen Puzzle

Program Listing

```
10 CLS
20 PRINT"GSETTR6/BAS  DOS 2.3 32k OR
                LEVEL II 16K WITH PRINTER
"
30 PRINT"BY T. W. MUSTICO
STATE UNIVERSITY COLLEGE AT OSWEGO
"
40 PRINT"PROGRAM DISTRIBUTED THROUGH
OSWEGO CLEAR-80
STATE UNIVERSITY COLLEGE AT OSWEGO
110 POUCHER HALL
OSWEGO NY, 13126
"
```

Program continues

Program continued

```
50 INPUT"PRESS ENTER TO CONTINUE";A$:CLS
60 CLEAR 3000
70 DEFINT I-N
80 DIM IG(1025),GG$(12)
90 CLS:INPUT "DO YOU NEED DIRECTIONS";D$:IFLEFT$(D$,1)="Y"THEN G
OSUB1160 :CLS ELSE CLS
100 INPUT "TO PRINT PROGRAM UNDER <SHIFT> <G> OPTION ENTER <1>";
MP
110 IF PEEK(14305)=255 THEN MP=1
120 GNS="":INPUT "INPUT NAME TO SAVE FILE OF GRAPHIC TO DISK
DEFAULT NAME WILL BE DUMMY/TXT";GNS
130 IF GNS=""GNS="DUMMY/TXT"
140 CLS
150 'TO TRANSLATE ANY GRAPHIC - INSERT AT 9000 AS A SOUBROUTINE
160 'GOSUB9000
170 A$="":IX=0:IY=0:J=1
180 LC=POINT(IX,IY):JX=IX:JY=IY
190 JA=PEEK(14400):KA=PEEK(14340):IFJA<>0  GOTO1300
200 IFA$="D" GOSUB 600  :GOTO170
210 IFA$="d"GOSUB610  :GOTO170
220 IFA$="Q" GOSUB1410 :GOTO170
230 IFA$="S" THEN SET(IX,IY):GOTO420
240 IFA$="R" THEN RESET(IX,IY):GOTO420
250 IF A$="M" THEN GOTO170
255 IFA$="h"THEN JB=IB:JE=IE:GOSUB1030:GOSUB510:GOSUB 1160:GOSUB
600:IB=JB:IE=JE:GOTO170
260 IF A$="F" GOSUB490
270 IF A$="B" GOSUB980  :IB=LO:NX=IX:NY=IY
280 IF A$="E" GOSUB980  :IE=LO:MX=IX:MY=IY
290 IF A$="L" G$="":LX=0:GOSUB660  :GOTO170
300 IF A$="X" THEN GOSUB1030 :GOSUB510  :GOTO170
310 IF A$="P" GOSUB1140 :GOTO170
320 IFA$="w" THEN GOSUB 1120
330 IFA$="g" THENGOSUB 1030 :GOSUB500  :GOSUB 1470 :GOTO120
340 IFA$="M" THEN GOSUB 970  :GOSUB1140 :GOTO 180
350 IFA$="V"PRINT @960, IX;,IY;
360 GOTO 450
370 IF LC =-1 THEN SET(JX,JY) ELSE RESET(JX,JY)
380 IF IX>127 THEN IY=IY+1:IX=0
390 IF IX<0   THEN IY=IY-1:IX=127
400 IF IY<0  THEN IY=0
410 IF IY>47 THEN IY=47
420 NC=POINT(IX,IY)
430 SET(IX,IY):RESET(IX,IY)
440 IF IR=1 RETURN
450 A$=INKEY$: IF A$="" GOTO430
460 IF NC=-1 THEN SET(IX,IY) ELSE RESET(IX,IY)
470 GOTO180
480 ' FETCH VALUE FOR CURSOR INCREMENTS
490 J=VAL(INKEY$):IFJ=0 THEN GOTO 490  ELSE RETURN
500 ' TRANSLATING ROUTINES HERE
510 FOR I=IB TO IB+IH*64 STEP 64
520 FOR J=0TOLG:IP=I+J
530 IF PEEK(IP)=128 POKE IP,32
535 IFPEEK(IP)>0ANDPEEK(IP)<27 THEN POKE IP,PEEK(IP)+64
540 IG(IP-15360)=PEEK(IP)
550 NEXTJ:NEXTI
560 RETURN
570 FOR I=1TO1024:PRINTCHR$(IG(I));:NEXT
580 RETURN
590 'THIS ROUTINE REDRAWS GRAPHIC AND RETURNS FOR ALTERATION
600 CLS
610 FOR I=IB TO IB+IH*64STEP64
620 FOR J=0TOLG:IP=I+J
630 POKE IP,IG(IP-15360)
640 NEXT J:NEXTI
650 RETURN
660 'THIS ROUTINE TRANSLATES SCREEN & PRINTS STRING SERIES
670 G$="":FOR I=1TOLX:GG$(I)="":NEXTI
680 IF PEEK(14312)=63 THEN LP=1 ELSE LP=0
690 IF LG=64 THEN LF$="":LF=0:LE$="": ELSE LE$=CHR$(26):LF$="CHR
$(26)":LF=1
700 BS$=LF$+"+STRING$("+STR$(LG+LF)+",24)"
710 IF LG+LF>=64 BS$="+CHR$(9)"
720 IF LP=1LPRINT"NOTE BS$= ";BS$:LPRINT" "
730 IC=0:N=1:FOR I=IB TO IB+IH*64 STEP64
740 IF IC=1 AND LP=1  LPRINT"+BS$";
750 IF IC=1 G$=G$+LE$+STRING$(LG+LF,24):GOSUB1080
760 IC=1:FOR J=0TOLG-1:IP=I+J
770 IF PEEK(IP)=128 POKEIP,32
780 IF PEEK(IP+1)=128 POKEIP,32
790 IF PEEK(IP)=PEEK(IP+1)THEN N=N+1:GOTO 820
800 IF N=1 GOSUB 890  :GOTO820
810 GOSUB 920  :N=1
820 NEXTJ
830 IF N>1THENGOSUB920  :N=1
840 NEXTI
850 IF N>1GOSUB920
860 IF LP=1 LPRINT" "
870 RETURN
880 'THIS ROUTINE TRANSLATES SCREEN AND PRINTS CHR$ SERIES
890 IF LP=1 LPRINT "+CHR$(";PEEK(IP);")";
900 G$=G$+CHR$(PEEK(IP)):GOSUB1080
910 RETURN
920 IF LP=1 THEN GOTO 930  ELSE GOTO940
930 IF PEEK(IP)<>32 THEN  LPRINT"+STRING$(";N;",";PEEK(IP);")";
ELSE IF N<63 THEN LPRINT"+CHR$(";192+N;")"; ELSE LPRINT "+CHR$(1
8)";
940 IF PEEK(IP)<>32 THENG$=G$+STRINGS(N,PEEK(IP)) ELSE IF N<63 T
HENG$=G$+CHR$(192+N) ELSE G$=G$+CHR$(10)
950 GOSUB1080 :N=1
960 RETURN
970 'ROUTINE TO DETERMINE POKE POSITION ON SCREEN FOR IX,IY
980 ID= IY/3
990 IO=IX/2
1000 LO =ID*64 +IO  +15360
1010 RETURN
1020 'ROUTINE TO CALCULATE BLOCK
1030 IF IB=0 AND IE=0 THEN LG=64:IH=15:IB=15360:IE=16383:RETURN
1040 LG=(MX-NX)/2+1.6:IFLG>64 THENLG=64
1050 IH=(IE/64+.99)-(IB/64+.99)
1060 IF IH>15:IH=15
1070 RETURN
1080 'MULTIPLE STRING ROUTINE
1090 IF LEN(G$)+LG >253 THEN LX=LX+1:GG$(LX)=G$:G$="" ELSE RETUR
N
1100 IFLP=1 LPRINT" ":LPRINT" "
1110 RETURN
1120 W$=STRING$(255,191):PRINT@0,W$;:FOR I=1TO3:PRINTW$;:NEXTI:W
$="":POKE16383,191:POKE16382,191:POKE16381,191:RETURN
1130 ' PRINT GRAPHIC FROM STRING CONCATENATIONS IN GG$
1140 IFA$="M"THEN A$="":K=LG-15360 ELSE K=IB-15360:CLS
1150 PRINT@K,;:FORI=1TOLX:PRINTGG$(I);:NEXT:PRINTG$;:RETURN
1160 CLS:PRINT"ARROWS CAUSE BLINKING CURSOR TO MOVE IN DIRECTION
 OF ARROW
S - WILL SET THE POSITION"
1170 PRINT "R - WILL RESET THE POSITION
B - INTERNALLY LOGS UPPER LEFT  POSITION OF GRAPHIC
E -          LOGS LOWER RIGHT POSITION OF GRAPHIC
F - FOLLOWED BY 1 TO 9 CONTROLS CURSOR JUMPS"
1180 PRINT"H - HOMES THE CURSOR
X - LOGS THE GRAPHIC FROM B TO E"
1190 PRINT"D - DISPLAY THE GRAPHIC USING CHR$ POKES
L - CONVERT TO CONCATENATED STRINGS - PRINT IF PRINTER ON"
1200 PRINT"P - DRAW HIGH SPEED GRAPHIC (L MUST BE USED FIRST) -
IF NOT CORRECT ALTER B OR E"
1210 PRINT"M - DRAW HIGH SPEED AT CURSOR POSITION USE L FIRST"
1220 PRINT"V - OUTPUT X,Y SET COORDINATES OF CURSOR"
1230 PRINT"Q - INSERT A LABEL AT CURSOR POSITION"
1240 INPUT"PRESS ENTER TO CONTINUE";D$
1250 PRINT"<SHIFT> D - DISPLAY WITHOUT CLS"
1260 PRINT"<SHIFT> W - WHITE OUT THE SCREEN
<SHIFT> G - CREATE PROGRAM ON DISK TO DRAW GRAPHIC

        AND/OR PRINT CREATED PROGRAM"
1265 PRINT"<SHIFT> H - HELP WITH COMMANDS"
1270 PRINT"
BLINKING CURSOR INDICATES COMMAND COMPLETED
"
1280 INPUT"PRESS ENTER TO CONTINUE";D$
1290 RETURN
1300 'FAST CURSOR ROUTINE
1310 IF JA =8 THEN IY=IY-J: GOTO 1350
1320 IF JA =32 THEN IX=IX-J: GOTO1350
1330 IF JA =4 THEN IX=IX+J: GOTO1350
1340 IF JA =16 THEN IY=IY+J:GOTO1350
1350 IR=1:GOSUB370
1360 IF KA=4 A$="R": RESET(IX,IY):NC=0
1370 IF KA=8 A$="S": SET(IX,IY):NC=-1
1380 IR=0
1390 JA=PEEK(14400):JA=0
1400 GOTO460
1410 ME$="":GOSUB980  :RESET(IX,IY):PRINT@LO-15360,"";
1420 B$=INKEY$:IF B$="" OR B$=CHR$(34)GOTO1420
1430 IF B$=CHR$(13) RETURN
1435 IFB$=CHR$(24) THEN GOTO1440 ELSE GOTO 1450
1440 B$="":IF LEN(ME$)>0THENME$=LEFT$(ME$,LEN(ME$)-1)
1450 ME$=ME$+B$
1460 PRINT@LO-15360,ME$;:GOTO1420
1470 'GENERATE BASIC PROGRAM IN ASCII NON-COMPRESSED HERE
1480 IFPEEK(14305)<>255 THEN OPEN "O",1,GN$
1490 GOSUB2150
1500 K=IB-15360:CC=0
1510 LI=0:GOSUB2140 :DG$=DG$+"REM **GRAPHICS IN THIS PROGRAM
GENERATED WITH GSETTK6/BAS
BY T. W. MUSTICO** NAMED "+GN$:GOSUB2040
1520 GOSUB2140 :DG$=DG$+"CLEAR 50":GOSUB2040
1530 GOSUB2140 :DG$=DG$+"DEFINTI-N:DEFSTRX-Z":GOSUB2040
1540 GOSUB2140 :DG$=DG$+"DIM DG$(9)":GOSUB2040
1550 LI=200
1560 KA=(K/64-INT(K/64))*64:GOSUB2070
1570 IC=0:FOR I=IB TO IB+IH*64 STEP 64
1580 IF IC=1 THEN LI=LI+5:GOSUB2000 :DG$=DG$+DB$:GOSUB2030 :CC=C
C+BC
1590 LI=LI+5:GOSUB2000
1600 N=1:IC=1:FORJ=0TOLG-1:IP=I+J
1610 IFJ<LG-1ANDPEEK(IP)=32ANDPEEK(IP+1)=32THENN=N+1:GOTO1710
1620 IFN=1 THEN II=PEEK(IP):GOSUB2010 :GOTO1710
1630 IFJ<>LG-1 GOTO1670
1640 IFPEEK(IP)=32 THEN II=192+N
1650 IF II>255 THEN II=193:GOSUB2010 :II=255
1660 GOSUB2010 :GOTO1700
1670 II=192+N:IF II>255THEN II=193:GOSUB2010 :II=255
1680 GOSUB2010
1690 IFPEEK(IP)<>32 THEN II=PEEK(IP):GOSUB2010
1700 N=1
1710 NEXTJ:GOSUB2030
1720 NEXTI
1730 LI=495
1740 GOSUB2140 :DG$=DG$+" REM CLEAR SPACE FOR "+STR$(CC)+ "  CHA
RACTERS.":GOSUB 2040
1750 NA=CC/225:NB=CC-NA*225
1760 GOSUB2140 :DG$=DG$+"REM EDIT DG$("+STR$(NA)+") TO "+STR$(NB
)+" CHARACTERS":GOSUB2040
1770 GOSUB2140 :DG$=DG$+"I=0:J=0:A=0:II=0:IK=0:IG=0":GOSUB2040
1780 GOSUB2140 :DG$=DG$+"FOR I=0TO4":GOSUB2040
1790 GOSUB2140 :DG$=DG$+"B=VARPTR(DG$(I))":GOSUB2040
1800 GOSUB2140 :DG$=DG$+"REM CALCULATE POKE ADDRESS":GOSUB2040
1810 GOSUB2140 :DG$=DG$+"A =PEEK(B+2)*256+PEEK(B+1)":GOSUB2040
1820 GOSUB2140 :DG$=DG$+"IF A>32767 THEN A=-1*(65536-A)":GOSUB20
40
1830 GOSUB2140 :DG$=DG$+"REMREAD AND THEN POKE EACH CHARACTER":G
OSUB2040
1840 GOSUB2140 :DG$=DG$+"FOR J=1TO225":GOSUB2040
1850 GOSUB2140 :DG$=DG$+" IG=A+J-1":GOSUB2040
1860 GOSUB2140 :DG$=DG$+"IF I*225+J>"+STR$(CC)+"GOTO900":GOSUB20
40
1870 GOSUB2140 :DG$=DG$+"READ II:POKE IG,II:NEXTJ":GOSUB2040
1880 GOSUB2140 :DG$=DG$+"NEXTI":GOSUB2040
1890 LI=895:GOSUB2140 :DG$=DG$+"DELETE 205-900":GOSUB2040
1900 GOSUB2140 :DG$=DG$+"CLS:IK=INT("+STR$(CC)+"/225):PRINT@"+ST
R$(K)+",Z$;":GOSUB2040
1910 GOSUB2140 :DG$=DG$+"FOR I=0TOIK:PRINT DG$(I);:NEXTI":GOSUB2
040
1920 LI=945:GOSUB2140 :DG$=DG$+"GOTO950":GOSUB2040
1930 LI=45
1940 IFCC<225GOTO1980
1950 FORI=0TONA-1
1960 GOSUB2140 :DG$=DG$+"DG$("+STR$(I)+")="+F$:GOSUB2040
1970 NEXTI
1980 IFNB>0:GOSUB2140 :DG$=DG$+"DG$("+STR$(NA)+")="+LEFT$(F$,NB+
1)+CHR$(34):GOSUB2040
1990 IFPEEK(14305)<>255 THENCLOSE:RETURN ELSE RETURN
2000 DG$=RIGHT$(STR$(LI),3)+" DATA":RETURN
2010 IF LEN(DG$)>235 THEN GOSUB2030 :LA=LI:LI=LI-4:GOSUB2140 :LI
=LA:DG$=DG$+"DATA"
2020 CC=CC+1:DG$=DG$+RIGHT$(STR$(II),3)+",":RETURN
2030 IF RIGHT$(DG$,1)="," THEN KG=LEN(DG$)-1:DG$=LEFT$(DG$,KG)
2040 IF PEEK(14305)<>255 THENPRINT#1,DG$
2050 IF MP=1 LPRINT DG$
2060 RETURN
2070 KC=3:DB$="26":IF KA=0 THEN KC=1
2080 IFKA+LG>=64 KC=2
2090 IFKA=0 AND KC=2 THEN DB$="9":BC=1:RETURN
2100 ON KC GOTO 2110 ,2120 ,2130
2110 DB$="10":BC=1:RETURN
2120 DB$="9"
2130 FOR I=1TOLG:DB$=DB$+","+"24":NEXTI:BC=LG+1:RETURN
2140 LI=LI+5:DG$=RIGHT$(STR$(LI),3):RETURN
2150 C$="THIS IS A DUMMY STRING "
2160 F$=C$+C$+C$+C$+C$+C$+C$+C$+C$+C$
2170 F$=LEFT$(F$,225)
2180 F$=CHR$(34)+F$+CHR$(34)
2190 RETURN
```

This utility helps you find the variables in your program.

Lost in Basic

Mark C. Paxton
4056 3-Oaks Blvd
Troy, MI 48098

This article will show you how to add the Find command to your machine. Find will then execute the machine language program included in this article. For example, in the normal command mode you will be able to key in Find A, which will cause Find to execute, filling the screen with the line numbers of everywhere the variable A was referenced (assuming that a Basic program was resident in memory at the time). This new command will lie dormant in high memory and will not affect the normal operations of your machine until it is activated by entry of its command word: Find.

About the Program

The Find program takes advantage of the fact that the TRS-80 uses a space compression code for every Basic command. These range from 80H to 0FFH in value. For example, when you enter the Basic statement—GOTO125—it will be stored in only four bytes: 8D313235. The 8D is the space compression code for the Basic GOTO command, while 313235 represents the 125 (in ASCII). Therefore, the letters G, O, and T from the GOTO command are never found in RAM memory. Whenever you List the program, the 8D is reconverted and displayed as GOTO.

The only alpha characters that are stored in memory are non-Basic commands, which are usually variable names, occasionally comments, and seldom syntax errors. Therefore, if you wanted to scan a Basic program for a grand total variable, which you might have assigned the name of GT, you would never have to contend programmatically with handling the character string GOTO in memory; you would merely bypass the 8D byte as inconsequential.

Using the Program

Key the source code using EDTASM and create a System tape named Find. Set memory size to 32320, and then load the System tape. You will note that when the program stops loading, the > command symbol appears immediately. (This is done with the last five statements in the program. It is a lot neater than having the "*?" symbol appear.)

At this point you can either CLOAD or key in a Basic program. Then if you wish to find all of the line numbers where the variable A is referenced, simply key in Find A. The variable names to be scanned for can only be from one to three bytes in length (including the special characters $,!,%, and #). Well, now I can find my missing variables, but I can't seem to be able to find my car keys, or my pencil, or . . . ■

Program Listing

```
41B2            00010          ORG     41B2H ;SET UP USER EXIT
41B2 C3407E     00020          JP      USEXIT
7E40            00030          ORG     32320 ;SET MEMSIZE TO THIS
7E40 E5         00040 USEXIT   PUSH    HL  ;SAVE BUFPTR
7E41 08         00050          EX      AF,AF'
7E42 D9         00060          EXX
7E43 E1         00070          POP     HL
7E44 23         00080          INC     HL ;POINT TO 1ST BYTE-BUFFR
7E45 11987E     00090          LD      DE,FINLIT ;POINT TO 1ST BYTE
-LIT
7E48 0604       00100          LD      B,4
7E4A 1A         00110 TESTIT   LD      A,(DE)
7E4B BE         00120          CP      (HL) ;DOES CHAR MATCH?
7E4C 2006       00130          JR      NZ,NOPE ;NO=EXIT
7E4E 23         00140          INC     HL
7E4F 13         00150          INC     DE
7E50 10F8       00160          DJNZ    TESTIT
7E52 1803       00170          JR      FIND
7E54 08         00180 NOPE     EX      AF,AF'
7E55 D9         00190          EXX
7E56 C9         00200          RET ;RET TO 1AA4H
7E57 E5         00210 FIND     PUSH    HL
7E58 08         00220          EX      AF,AF'
7E59 D9         00230          EXX
7E5A 1876       00240          JR      SCAN
                00250 ;*********************************
                00260 ;* OCT.  06, 1980  -----   FIND  *
                00270 ;*********************************
0000            00280 BEGWS    DEFS    0
0002            00290 SVLINE   DEFS    2
0004            00300 FIELD    DEFS    4
0003            00310 HLDFLD   DEFS    3
7E65 46         00330 PRGMID   DEFM    'FIND VARIABLE-VERS 10.06.80
'
7E80 0D00       00340          DEFW    000DH
7E82 4E         00350 MSG1     DEFM    'NO SOURCE PGM IN MEM'
7E96 0D00       00360          DEFW    000DH
7E98 46         00361 FINLIT   DEFM    'FIND'
28A7            00390 DISP     EQU     28A7H
40A4            00400 BEGADD   EQU     40A4H
40F9            00410 ENDADD   EQU     40F9H
                00440 ;***************
                00450 ;* SUBROUTINES  *
                00460 ;***************
7E9C 3E5A       00470 VALCHR   LD      A,'Z'   ; 90
7E9E BE         00480          CP      (HL)    ;A-(HL)
7E9F FAB47E     00490          JP      M,NONVAL        ;(HL) > 'Z'
7EA2 3E2F       00500          LD      A,2FH
7EA4 BE         00510          CP      (HL)
7EA5 F2B47E     00520          JP      P,NONVAL
7EA8 3E39       00530          LD      A,'9'
7EAA BE         00540          CP      (HL)
7EAB F2B67E     00550          JP      P,VALID
7EAE 3E40       00560          LD      A,'@'
7EB0 BE         00570          CP      (HL)
7EB1 FAB67E     00580          JP      M,VALID
7EB4 AF         00590 NONVAL   XOR     A
7EB5 C9         00600          RET
7EB6 3E01       00610 VALID    LD      A,1
7EB8 C9         00620          RET
7EB9 3E24       00630 SPCCHR   LD      A,'$'
7EBB BE         00640          CP      (HL)
```

Program continues

Program continued

```
7EBC 2811      00650          JR      Z,SPCVAL
7EBE 3E23      00660          LD      A,'#'
7EC0 BE        00670          CP      (HL)
7EC1 280C      00680          JR      Z,SPCVAL
7EC3 3E21      00690          LD      A,'!'
7EC5 BE        00700          CP      (HL)
7EC6 2807      00710          JR      Z,SPCVAL
7EC8 3E25      00720          LD      A,'%'
7ECA BE        00730          CP      (HL)
7ECB 2802      00740          JR      Z,SPCVAL
7ECD AF        00750          XOR     A
7ECE C9        00760          RET
7ECF 3E01      00770 SPCVAL   LD      A,1
7ED1 C9        00780          RET
7ED2 215C7E    00830 SCAN     LD      HL,BEGWS
7ED5 115D7E    00840          LD      DE,BEGWS+1
7ED8 010008    00850          LD      BC,8
7EDB 3600      00860          LD      (HL),00H
7EDD EDB0      00870          LDIR
7EDF E1        00880          POP     HL
7EE0 D7        00890          RST     10H ;POINT HL TO VAR NAME
7EE1 115E7E    00920          LD      DE,FIELD
7EE4 0603      00930          LD      B,3
7EE6 7E        00940 TRANS    LD      A,(HL)
7EE7 B7        00950          OR      A
7EE8 2805      00960          JR      Z,CONT
7EEA 12        00970          LD      (DE),A
7EEB 13        00980          INC     DE
7EEC 23        00990          INC     HL
7EED 10F7      01000          DJNZ    TRANS
7EEF CDC901    01010 CONT     CALL    01C9H
7EF2 21657E    01020          LD      HL,PRGMID
7EF5 CDA728    01030          CALL    DISP
7EF8 ED4BA440  01040          LD      BC,(BEGADD)
7EFC 2AF940    01050          LD      HL,(ENDADD)
7EFF 2B        01060          DEC     HL
7F00 2B        01070          DEC     HL
7F01 B7        01080          OR      A
7F02 ED42      01090          SBC     HL,BC
7F04 2009      01100          JR      NZ,CONT2
7F06 21827E    01110          LD      HL,MSG1
7F09 CDA728    01120          CALL    DISP
7F0C C3191A    01130          JP      1A19H
7F0F E5        01140 CONT2    PUSH    HL
7F10 11203C    01150          LD      DE,3C20H
7F13 ED532040  01160          LD      (4020H),DE
7F17 215E7E    01170          LD      HL,FIELD
7F1A CDA728    01180          CALL    DISP ;DISP VARIABLE
7F1D 11403C    01190          LD      DE,3C40H
7F20 ED532040  01200          LD      (4020H),DE
7F24 C1        01210          POP     BC ;SET UP # BYTES
7F25 2AA440    01220          LD      HL,(BEGADD)  ;PTR TO BEG TEX
T
7F28 23        01230 SAVELN   INC     HL
7F29 0B        01240          DEC     BC
7F2A 23        01250          INC     HL
7F2B 0B        01260          DEC     BC
7F2C 7E        01270          LD      A,(HL)
7F2D 325C7E    01280          LD      (SVLINE),A
7F30 23        01290          INC     HL
7F31 0B        01300          DEC     BC
7F32 7E        01310          LD      A,(HL)
7F33 325D7E    01320          LD      (SVLINE+1),A
7F36 23        01330          INC     HL
7F37 0B        01340          DEC     BC
7F38 AF        01350 EXAMIN   XOR     A
7F39 32627E    01360          LD      (HLDFLD),A
7F3C 32637E    01370          LD      (HLDFLD+1),A
7F3F 32647E    01380          LD      (HLDFLD+2),A
7F42 BE        01390          CP      (HL)
7F43 2009      01400          JR      NZ,EXAM01
7F45 23        01410 BMPSAV   INC     HL
7F46 0B        01420          DEC     BC
7F47 78        01430          LD      A,B
7F48 B1        01440          OR      C
7F49 CAED7F    01450          JP      Z,ENDPRG
7F4C 18DA      01460          JR      SAVELN
7F4E CD9C7E    01470 EXAM01   CALL    VALCHR
7F51 FE01      01480          CP      1
7F53 2809      01490          JR      Z,EXAM02
7F55 23        01500 BMPRTN   INC     HL
7F56 0B        01510          DEC     BC
7F57 78        01520          LD      A,B
7F58 B1        01530          OR      C
7F59 CAED7F    01540          JP      Z,ENDPRG
7F5C 18DA      01550          JR      EXAMIN
7F5E 7E        01560 EXAM02   LD      A,(HL)
7F5F 32627E    01570          LD      (HLDFLD),A
7F62 23        01580          INC     HL
7F63 0B        01590          DEC     BC
7F64 78        01600          LD      A,B
7F65 B1        01610          OR      C
7F66 CAED7F    01620          JP      Z,ENDPRG
7F69 AF        01630          XOR     A
7F6A BE        01640          CP      (HL)
7F6B 2835      01650          JR      Z,CHECK
7F6D CD9C7E    01660          CALL    VALCHR
7F70 FE01      01670          CP      1
7F72 280D      01680          JR      Z,EXAM03
7F74 CDB97E    01690          CALL    SPCCHR
7F77 FE01      01700          CP      1
7F79 2027      01710          JR      NZ,CHECK
7F7B 7E        01720          LD      A,(HL)
7F7C 32637E    01730          LD      (HLDFLD+1),A
7F7F 1821      01740          JR      CHECK
7F81 7E        01750 EXAM03   LD      A,(HL)
7F82 32637E    01760          LD      (HLDFLD+1),A
7F85 23        01770          INC     HL
7F86 0B        01780          DEC     BC
7F87 78        01790          LD      A,B
7F88 B1        01800          OR      C
7F89 CAED7F    01810          JP      Z,ENDPRG
7F8C AF        01820          XOR     A
7F8D BE        01830          CP      (HL)
7F8E 2812      01840          JR      Z,CHECK
```

Program continues

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Program continued

```
7F90 CD9C7E   01850          CALL    VALCHR
7F93 FE01     01860          CP      1
7F95 2807     01870          JR      Z,SAVCHK
7F97 CDB97E   01880          CALL    SPCCHR
7F9A FE01     01890          CP      1
7F9C 2004     01900          JR      NZ,CHECK
7F9E 7E       01910 SAVCHK   LD      A,(HL)
7F9F 32647E   01920          LD      (HLDFLD+2),A     ;3RD  CHAR
7FA2 3A5E7E   01930 CHECK    LD      A,(FIELD)
7FA5 DD21627E 01940          LD      IX,HLDFLD
7FA9 DDBE00   01950          CP      (IX)
7FAC 2037     01960          JR      NZ,EXIT
7FAE 3A5F7E   01970          LD      A,(FIELD+1)
7FB1 DDBE01   01980          CP      (IX+1)
7FB4 202F     01990          JR      NZ,EXIT
7FB6 3A607E   02000          LD      A,(FIELD+2)
7FB9 DDBE02   02010          CP      (IX+2)
7FBC 2027     02020          JR      NZ,EXIT
7FBE E5       02030 DISPLN   PUSH    HL
7FBF C5       02040          PUSH    BC
7FC0 2A5C7E   02050          LD      HL,(SVLINE)
7FC3 CD9A0A   02060          CALL    0A9AH
7FC6 AF       02070          XOR     A
7FC7 CD3410   02080          CALL    1034H
7FCA B6       02090          OR      (HL)
7FCB CDD90F   02100          CALL    0FD9H
7FCE ED5B2040 02110          LD      DE,(4020H)
7FD2 213041   02120          LD      HL,4130H
7FD5 010600   02130          LD      BC,6
7FD8 EDB0     02140          LDIR
7FDA 13       02150          INC     DE
7FDB 13       02160          INC     DE
7FDC ED532040 02170          LD      (4020H),DE
7FE0 CD9B1D   02180          CALL    1D9BH
7FE3 C1       02190          POP     BC
7FE4 E1       02200          POP     HL
7FE5 AF       02210 EXIT     XOR     A
7FE6 BE       02220          CP      (HL)
7FE7 CA457F   02230          JP      Z,BMPSAV
7FEA C3557F   02240          JP      BMPRTN
7FED 21403F   02250 ENDPRG   LD      HL,3F40H
7FF0 222040   02260          LD      (4020H),HL
7FF3 C3191A   02280          JP      1A19H
7FF6 3EC9     02290 AUTO     LD      A,0C9H
7FF8 32E241   02300          LD      (41E2H),A
7FFB C3191A   02310          JP      1A19H
41E2          02320          ORG     41E2H
41E2 C3F67F   02330          JP      AUTO
0000          02340          END
00000 TOTAL ERRORS
```


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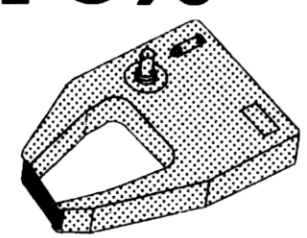

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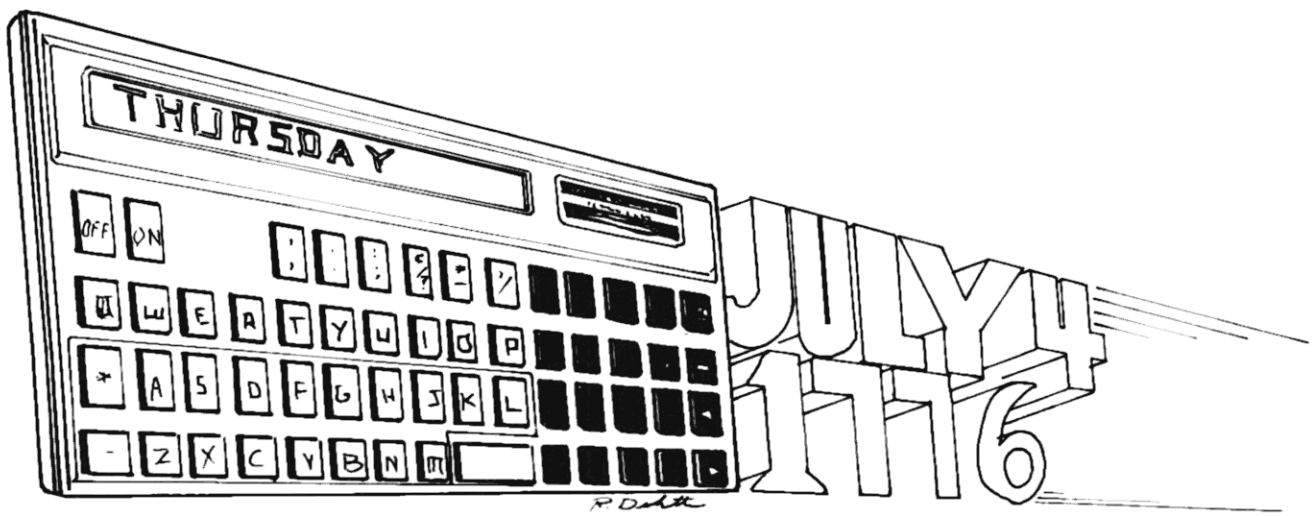

Dr. Walter J. Atkins, Jr.
QTRS 4410 A
USAF Academy, CO 80840

What day of the week was July 4, 1776? Without a TRS-80 pocket computer and this program you can only guess.

A program telling the day of the week for any date can be very useful. Everyone is curious about their birthdate; planners often have to pinpoint dates without a calendar. Some of us are dismayed to find our retirement date falls on a Saturday.

I adapted this program for the pocket computer from one written for a Hewlett Packard HP-25 programmable calculator. This program gives correct results for dates after September 14, 1752. Saturday, Wednesday and Thursday are shortened because a pocket computer string may contain a maximum of seven letters.

By the way, July 4, 1776 was a Thursday.■

```
10  REM "WEEKDAY"
20  REM "W.J. ATKINS"
30  REM "COPYRIGHTED"
40  PAUSE ""WEEKDAY PROGRAM"
50  PAUSE "FOR DATES SINCE 9/14/1752"
60  PAUSE "ENTER MON.,DAY,YEAR"
70  PAUSE "(E.G. 8/5/1943)"
80  INPUT "MONTH (1-12) =>";M,"DAY (1-31) =>";D, "YEAR =>";Y
90  IF M = 0 THEN 40
100 IF M = 1 LET M = 13:Y = Y - 1
110 IF M = 2 LET M = 14:Y = Y - 1
120 G = INT(13*(M + 1)/5)
130 H = INT(Y/100)
140 I = INT(Y/100)
150 J = INT(Y/400)
160 W = D + G + H - I + J
170 W = W INT(W/7)*7
180 IF M = 13 LET Y = Y + 1
190 IF M = 14 LET Y = Y + 1
200 IF M = 13 LET M = 1
210 IF M = 14 LET M = 2
220 IF W = 0 LET A$ = "SATURDY"
230 IF W = 1 LET A$ = "SUNDAY"
240 IF W = 2 LET A$ = "MONDAY"
250 IF W = 3 LET A$ = "TUESDY"
260 IF W = 4 LET A$ = "WEDNSDY"
270 IF W = 5 LET A$ = "THURSDAY"
280 IF W = 6 LET A$ = "FRIDAY"
290 BEEP 1
300 PRINT M;"/";D;"/";Y;"<=> ";A$
310 GOTO 60
```

Program Listing

Color Computer News

Color Computer News is the first and only magazine devoted to the users of Radio Shack's Color Computer. **Color Computer News** allows CC users to have a source of information about their machine plus forums for the exchange of ideas, discoveries, helps, and complaints. **CCN** is published every other month and contains features like 6809 Assembler programming, Novice Basic, Advanced Basic, Letters and Technical Forums. **CCN** reviews current products for the Color Computer and tells the truth about them, good or bad.

It's not just a beginner's magazine either. It prints what old hacker's need to know too. Things like entry points to the ROM and pointers in the Basic scratchpad.

Color Computer News is more than just a magazine. It's also a software exchange service. Color Computer owners can exchange original software by contributing it to the **CCN** library where several of these programs are put on a tape and distributed for a nominal fee. **CCN** is also a nationwide User's Group. **CCN** helps establish local User's Groups with form letters, posters, names and publicity.

If you own a Color Computer you need a subscription to **Color Computer News**. While the other magazines will print some articles about the Color Computer you need a constant source of information to stay abreast of what's happening with the Color Computer.

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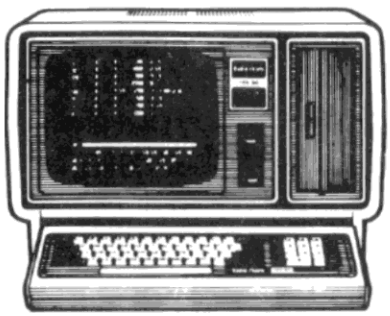

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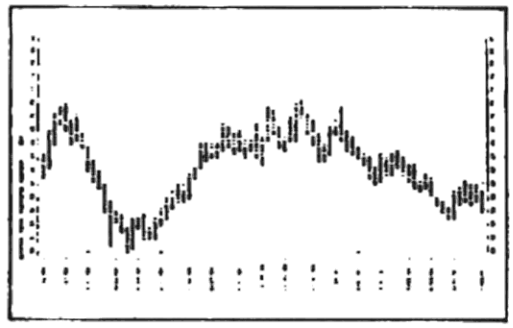

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An unpredictable dissertation on randomness.

Ordered Chaos

Ken Webb
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Ever since the first caveman threw a bone into the air and asked his mate to bet which side would land facing up, humans have pursued an active interest in random processes. Today scientists recognize that the fundamental workings of the universe are themselves random, yet at our level of everyday existence, composed as we are of trillions of atoms, things do seem to have some order to them.

The importance of randomness carries well beyond its use in predicting dice and card games, and in deciding the outcome of an encounter with Klingons.

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Simple Examples

Program Listing 1.1A displays random integers between one and whatever number you enter. This upper limit must be less than 32768.

Entering 0 (try it) produces a different type of output and suggests one means of producing random numbers in the range 1 to 999,999 (Listing 1.1B).

Listing 1.1C shows how RND(X) is more likely to look in an actual program.

Program Listing 1.2A is a more flexible random number generator. Run the program, and enter the lower limit (greater than – 1000000), a comma and then the upper limit (less than 1000000, and greater than the lower limit).

The difference between the upper and lower limits must be less than 32767. Try entering – 100000, – 90000; or 128,191; or – 10,10.

Listing 1.2B shows how this routine looks in an actual program, if the lower and upper limits were – 100 and 100.

Listing 1.3A is even more flexible. With this program you can specify lower and upper limits, and the interval between numbers; for example, only even numbers, or only numbers evenly divisible by 13.

To display random even integers between 100 and 200, run the program and enter 100,200,2. For odd numbers try 101,200,2.

Listing 1.3B gives random integers between 100 and 1000 that are multiples of 10.

Displaying random numbers is not particularly interesting. Displaying in random order some set of objects, each represented by a specific number is more helpful to the programmer.

For example, Listing 1.4 fills the screen with a random collection of TRS-80 graphic characters (CHR$(128) to CHR$(191)). Can you guess what will happen if you change line 720 to X = RND(26) + 64?

Order out of Randomness

In the first paragraph I told you that if enough randomly acting elements are combined, a certain predictable order results. For the computer programmer, this suggests that it should be possible to use RND(X) to generate patterns that are no longer random.

As a simple example, enter and run the coin tossing program, Listing 2A. From left to right, your screen displays the number of coin tosses, whether the last toss was a head (H) or a tail (T), and the ratio of heads to tails.

No matter how long the program runs, you can never predict whether the next toss will be heads or tails. But the ratio of heads to tails is predictable, and once the number of tosses gets above a few hundred, the figure should be close to 50:50. You see, a collection of random happenings may no longer be random. Casino operators, gamblers and computer program-

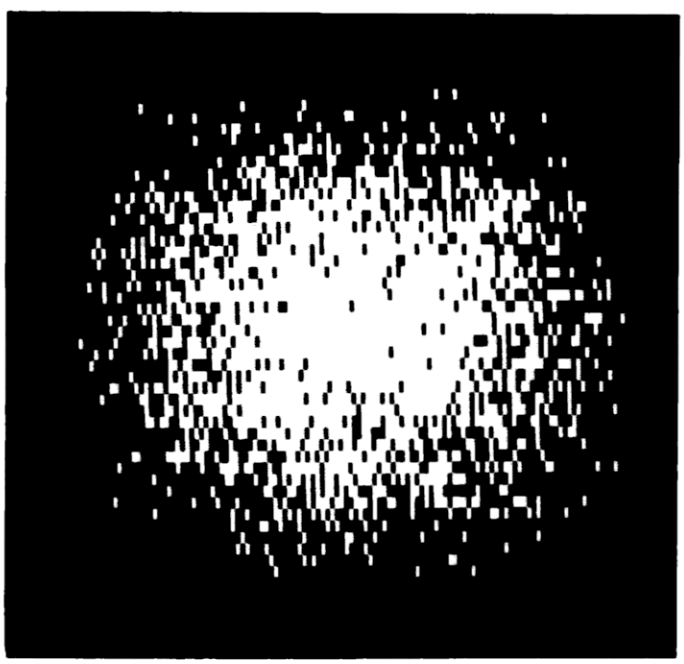

Photo 1. Circular distribution produced by Listing 4.2.

mers should keep this in mind.

Practical Uses for RND(X)

Enter and run Program Listing 3.1A, a dice game. Every time you hit a key, the computer rolls two dice, and displays the individual outcome plus the total of the two. Note that the program uses RND(6) twice, and that for two dice thrown together, a six is five times as likely as a two. (In Backgammon, for example, you're safer two spaces in front of an opponent rather than six.) Again, when random events are taken together, the degree of their randomness declines.

Change the program to allow any number of dice to be rolled, and see what you get. You may also want to check the distribution of the totals as was done in Listing 2A.

If a deck of cards is stored in the form of an array (C$(1) = "2 CLUBS" . . . C$(52) = "ACE SPADES"), then PRINTC$(RND (52)) will select and display a single card at random. To learn one way of setting up a shuffling one or two entire decks, study the blackjack program that comes with the TRS-80.

Program Listing 3.3, StarTrek, displays a random assortment of background stars as one might find in a Startrek game. To save memory and programming effort, use RND(X) when it's unimportant exactly where on the screen something is displayed.

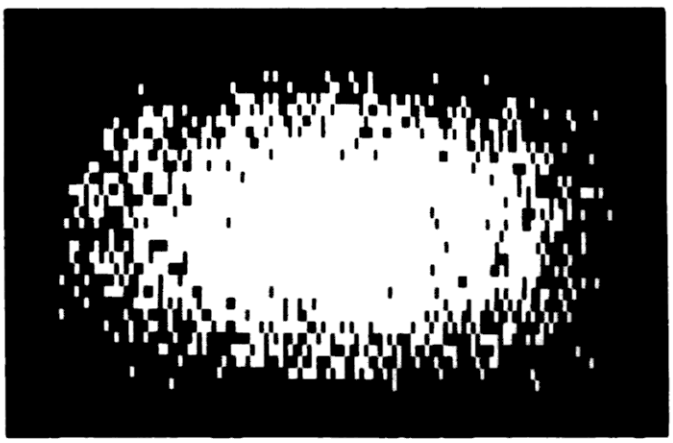

Photo 2. Elliptical distribution drawn by Listing 4.2 with altered line 1430.

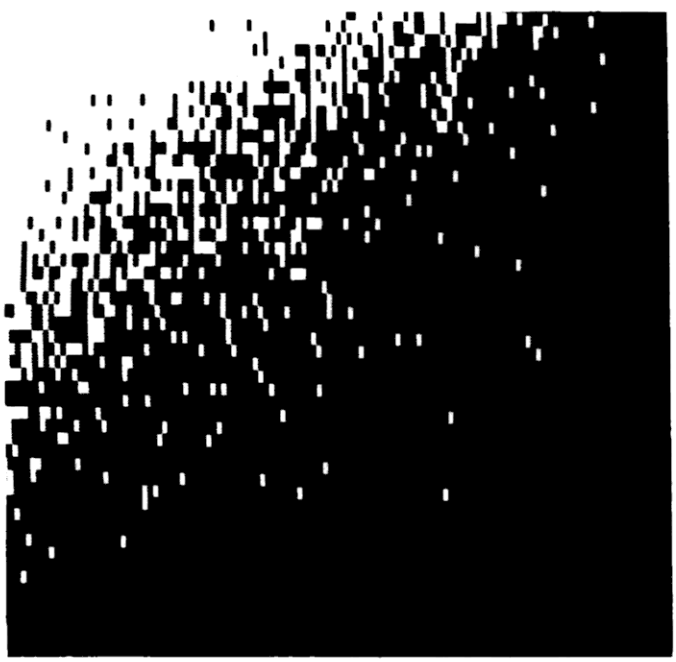

Photo 3. Hyperbolic shape drawn by Listing 4.3.

RND(X) is great for generating drill questions. There are at least two general approaches depending on the subject matter. In arithmetic problems the computer can generate both question and answer by means of RND(X).

Listing 3.4 is the basis for a program to help your kids learn addition.

Unlike a mathematical problem, the computer has no similar built-in way of knowing what combinations of letters are valid country names and what their capitals are. The programmer must provide both question and answer.

The flashcard program in the book TRS-80 Programs by Tom Rugg and Phil Feldman is a good example of this type of program. With the help of RND(X) the computer presents one side of a randomly selected "card". The student must correctly input the corresponding side two.

Program Listing 3.5, Memory Improvement, prints a random series of letters for you to remember, at a random location along the left of the screen. You may choose the length of "words" and how long they will be displayed.

Figures

Let's use the random function to draw geometrical figures.

In listing 3.1, we saw that if you roll two dice and record the combined results, that you'll get more sixes than twos or 12s. In general, if you add two or more randomly generated numbers, the totals bunch up toward the center.

Enter and run Program Listing 4.1. Let it run for a couple of minutes to see what you get. Then change line 1320 to:

```
1320 A = RND(42):B = RND(42):
C = RND(42):X = A + B + C
```

Run this. Do you see a difference? Now try:

```
1320 A = RND(10):B = RND(10):
C = RND(10):X = A + B + C
```

To calculate the approximate center of distribution, add the numbers and divide by two. For example, (42 + 42 + 42)/2 = 63, the horizontal center of the screen. The width of the figure is determined partly by the number of RNDs. The sum of the numbers (42 + 42 + 42 for example) should be less than 127, the width of the screen, or you'll get an error.

Program Listing 4.2 produces a circular distribution of points on the screen. For an elliptical shape, change line 1430 to:

```
1430 D = RND(10):E = RND(10):
F = RND(10):Y = D + E + F + 8
```

What is a hyperbola? To find out, enter and run Program Listing 4.3. The pattern looks at first like a quarter section from a circular pizza, but after a few minutes you'll see that the "crust" curves in the opposite direction.

Program Listing 4.4 gives a parabolic shape. Thus, using just RND and Set, you can draw solid surfaces corresponding to all the conic sections of the ancient Greeks: circle/ellipse, hyperbola and parabola.

A Humanoid Face

Program Listing 5 puts all the above together, using RND, Set, Reset and For . . . Next loops to construct a set of eyes, a nose, and a mouth.

The eyes are ellipses with the centers darkened using Reset. The nose is a hyperbola and its mirror image, while the mouth is a set of parabolas.

The face will be slightly different each time you run the program (same species, but different individual). Who knows, one of them might resemble that first bone tossing caveman.

Random

Unlike a person, who can never hold and throw a bone or a die exactly the same way twice, the computer is capable of performing the same action millions of times and always getting the same result. An upredictable computer isn't much use.

So how do you get a perfectly predictable machine to give you random numbers?

Next time you turn on your computer, enter the following:

```
10 FOR X = 1 TO 20: PRINT RND(6);: NEXT
```

When I run this on my Level II machine, I get the following numbers: 5,5,1,4,1,4,3,4,4,6,3,6, 1,4,5,2,4,3,1,1.

If all Model I Level II TRS-80s have the same Basic interpreter (ROM), then all such machines should give the same string of numbers. I'll assume that your screen is displaying the above numbers, and offer it as proof that computer-generated random numbers are predictable after all (technically, they're called pseudo-random numbers for this reason).

Every time you rerun the program without turning the machine on and off, you'll get a different set of random numbers, but, again, the same set that everyone else with a TRS-80 would have gotten.

Now turn your computer off and on again, enter the following:

```
10 RANDOM: FOR = X 1 TO 20:
PRINT RND(6);: NEXT
```

Each time you run this (including the times you turn the machine off and on) you'll get a different string of numbers. The random statement causes the machine's random number generator to be random itself, and is inserted at the beginning of most programs that use RND.

Sometime it may be useful to use RND repeatedly and always get the same set of numbers. Delete the RANDOM: in line 10 above, and add:

```
5 INPUT A,B,C: POKE16554,A:
POKE16555,B: POKE16556,C
```

Run this two-line program and enter 255,255,255 in response to ?__. Look familar? It's old 5 5 1 4 . . . again.

The Level II random number generator uses memory locations 16554 to 16556 each time it generates a random number. It then puts new numbers back into these locations to be used the next time it's called.

When the computer is first turned on, each of these locations contains the number 255. When the random statement is executed, the machine copies the contents of one of its internal registers (R), which is constantly changing, into memory location 16555.

By manipulating the contents of these three locations, you should be able to figure how to "load" the dice in many popular games—although, you'll probably be suspected if you always win.

If you want Listing 5 to always come up with exactly the same face, you could delete :RANDOM and insert a line at the beginning of the program to POKE specified numbers into memory locations 16554 to 16556. Otherwise you only have one chance in 16,777,216 (256•256•256) of getting the same face the second time.

We've now seen how a perfectly predictable machine can produce random numbers. The progression is from order, to chaos (or perhaps more accurately, ordered chaos), and back to order.■

Program Listing 1.1A-5 for Random Generation

```
1 'LISTING 1.1A
3 '
10 INPUTN:CLS
20 X=RND(N):PRINTX;:GOTO20
99 '*******************************
101 'LISTING 1.1B
103 '
110 INPUTN:CLS
120 X=INT(RND(0)*1000000)
130 IFX>NTHEN120
140 PRINTX;:GOTO120
199 '*******************************
201 'LISTING 1.1C
203 '
210 X=RND(100):PRINTX;:GOTO210
299 '*******************************
301 'LISTING 1.2A
303 '
310 INPUTM,N:CLS
320 X=RND(N-M+1)-1+M:PRINTX;:GOTO320
399 '*******************************
401 'LISTING 1.2B
403 '
410 X=RND(201)-101:PRINTX;:GOTO410
499 '*******************************
501 'LISTING1.3A
503 '
510 INPUTM,N,J:CLS
520 X=(RND((N-M)/J+1)-1)*J+M:PRINTX;:GOTO520
599 '*******************************
601 'LISTING 1.3B
603 '
610 X=RND(91)*10+90:PRINTX;:GOTO610
699 '*******************************
701 'LISTING1.4
703 '
710 FORN=0TO1022
720   X=RND(64)+127
730   PRINTCHR$(X);
740 NEXTN
750 GOTO750
799 '*******************************
801 'LISTING 2A
803 '
810 RANDOM:C(1)=0:C(2)=0:C$(1)="H":C$(2)="T"
```

Program continued

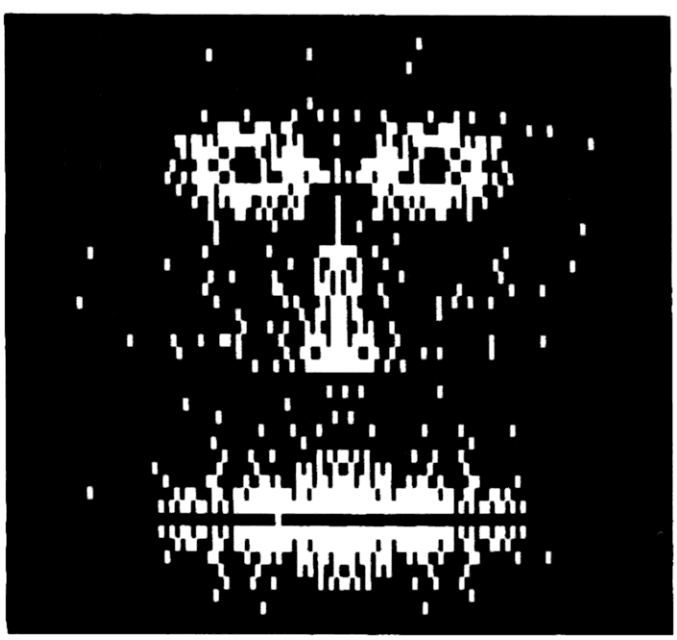

Photo 5. Humanoid face is the result of Listing 5.

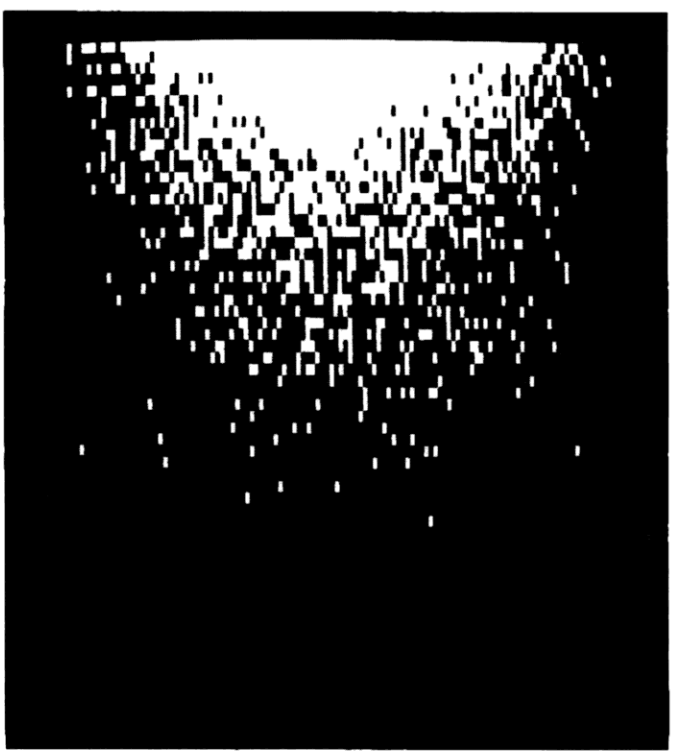

Photo 4. Parabolic figure produced by Listing 4.4.

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```
820 FORN=1TO10000
830   X=RND(2):C(X)=C(X)+1:C=C(1)+C(2)
840   C1=INT(100*C(1)/C):C2=INT(100*C(2)/C)
850   CLS:PRINT@320,N;C$(X),C1;":";C2
860 NEXTN
899 '*******************************
901 'LISTING 3.1
903 '
910 A$=INKEY$:IFA$=""THEN910
920 D1=RND(6):D2=RND(6):D=D1+D2
930 PRINTD1;D2,D
940 GOTO910
999 '*******************************
1001 'LISTING 3.3
1003 '
1010 CLS:FORX=1TO30:POKERND(1023)+15359,46:NEXT
1020 GOTO1020
1099 '*******************************
1101 'LISTING 3.4
1103 '
1110 RANDOM
1120 CLS:X=RND(100)-1:Y=RND(100)-1:Z=X+Y
1130 PRINTCHR$(23):PRINT@220,X;:PRINT@346,"+";Y;
1140 PRINT@410,"------";:PRINT@536,;:INPUTA
1150 IFA=ZTHENPRINT@768,"YES";:ELSEPRINT@768,"NO";
1160 FORN=1TO600:NEXTN:GOTO1120
1199 '*******************************
1201 'LISTING 3.5
1203 '
1210 CLS:CLEAR(200):INPUT"LENGTH (1-63)";L:INPUT"DELAY (10-2000)
";D
1220 CLS:X$="":FORX=1TOL:X$=X$+CHR$(RND(26)+64):NEXTX
1230 PRINT@(RND(16)-1)*64+1,X$;:FORN=1TOD:NEXTN:CLS
1240 INPUT"WHAT WERE THE LETTERS";Y$
1250 PRINT@128,"THE ANSWER IS ";X$
1260 FORN=1TO1000:NEXTN:GOTO1220
1299 '*******************************
1301 'LISTING 4.1
1303 '
1310 CLS
1320 A=RND(63):B=RND(63):X=A+B
1330 Y=RND(47)
1340 SET(X,Y)
1350 GOTO1320
1399 '*******************************
1401 'LISTING 4.2
1403 '
1410 CLS
1420 A=RND(42):B=RND(42):C=RND(42):X=A+B+C
1430 D=RND(15):E=RND(15):F=RND(15):Y=D+E+F
1440 SET(X,Y)
1450 GOTO1420
1499 '*******************************
1501 'LISTING 4.3
1503 '
1510 CLS
1520 X=RND(RND(RND(127)))
1530 Y=RND(RND(RND(47)))
1540 SET(X,Y)
1550 GOTO1520
1599 '*******************************
1601 'LISTING 4.4
1603 '
1610 CLS
1620 X=RND(42)+RND(42)+RND(42)
1630 Y=RND(RND(RND(47)))
1640 SET(X,Y)
1650 GOTO1620
1699 '*******************************
2001 'LISTING 5
2003 '
2009 '                        HEAD
2010 CLS:RANDOM
2020 FORN%=1TO100
2030   X=RND(55)+RND(55)+8
2040   Y=RND(23)+RND(23)
2050   SET(X,Y)
2060 NEXTN%
2099 '                        EYES
2100 FORN%=1TO300
2110   X=RND(12)+RND(12)+RND(12)
2120   Y=RND(3)+RND(3)+RND(3)+RND(3)+4
2130   SET(X+27,Y):SET(100-X,Y)
2140 NEXTN%
2150 FORN%=1TO50
2160   X=RND(5)+RND(5)+RND(5)
2170   Y=RND(2)+RND(2)+9
2180   RESET(X+37,Y):RESET(90-X,Y)
2190 NEXTN%
2199 '                        NOSE
2200 FORN%=1TO200
2210   X=RND(RND(RND(RND(RND(63)))))-1
2220   Y=RND(RND(RND(23)))
2230   SET(63+X,29-Y):SET(63-X,29-Y)
2240 NEXTN%
2299 '                        MOUTH
2300 FORN%=1TO200
2310   X=RND(30)+RND(30)+RND(30)+18
2320   Y=RND(RND(RND(7)))+40
2330   SET(X,Y):SET(127-X,Y)
2340   SET(X,80-Y):SET(127-X,80-Y)
2350 NEXTN%
2400 GOTO2400
2999 '******************************* THE END
```


Really, what can you do with a dual sided disk drive on a Model I? **Nothing** – without the *Dual Sided Disk Kit*. Using it you can put up to 3 of them on your system. You don't have 3 dual sided drives? Now you can add them – painlessly. This kit lets you mix dual and single head drives, in any combination. That's not all, 35-, 40-, 77-, and 80-track drives can be combined in any order.

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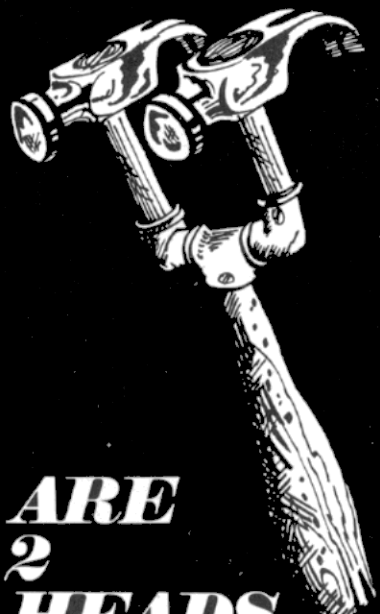

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Get these cousins talking to each other.

Model I, Meet Model III

Mike Barlow and Jim Brydges
7925 Cote Luc Road
Montreal, Quebec, Canada
H4W 1R5

Because our office uses Models I and III TRS-80s for job control and minor calculations we are deep in the Model I to Model III conversion process.

Conversion Problems

All our program development was done under NEWDOS 80 on the Model I using utilities such as Control (giving single-key access to all printer functions), Splitter (enabling two programs to run independently and simultaneously), and Catalog (to index all disks).

Output under TRSDOS is very slow due to unfamiliarity with the TRSDOS commands and to the innate operational slowness of TRSDOS relative to NEWDOS. We prefer to program under NEWDOS, not yet available for the Model III.

Two-way conversion facilities are not in the Model III Convert utility. This utility requires a Model I disk in drive one, and a Model III disk containing TRSDOS and enough free space in drive zero. You cannot read the directory of the Model I disk, nor can you Kill, Purge, or deal selectively with the files on that disk. It is all or nothing.

The transfer takes place one file at a time, with the name of the file displayed on the screen. If that name exists on the Model III disk, "File already exists. Use It? (Y/N/Q)" appears. Answer this ambiguous message Y if the conversion is to proceed, N if not, and Q if no more conversions are required. You can also hit Reset to terminate the conversion if no more files are required. If the conversion utility asked that question for every existing or nonexistent file its utility would be greatly enhanced.

The Convert program runs well, but slowly. If a Disk Space Full or Operation Aborted message appears, try again. After conversion, copy the files you wish to keep to another disk; you must keep one disk for a Convert scratch pad.

Cassette Dubbing

To avoid the all-or-nothing conversion and to provide a reverse conversion use the cassette facilities of the Model I and III machines side by side.

The routine is simple. Set up the cassette with its aux input (grey plug) connected to the source machine, and its ear output (black plug) connected to the destination machine. (You need two cassette cables for this.)

Load the Model III with TRSDOS Basic as usual. Set the cassette speed to low and remain in Basic by entering DEFUSR = 12354. On typing C = USR(0) the prompt cassette appears. Answer L and the Model III is ready.

Load the source machine with the program to be copied. Type CMD"T" on the Model I to disable the interrupts. Hold down the record inhibit finger so the recorder enters and locks in the record mode, mechanism running. Enter CLOAD on the destination machine; Enter CSAVE "A" on the source machine.

The destination machine should show two flashing asterisks in the top right corner of the screen. When Ready appears, save the program to disk as usual.

The above procedure is slow (300 baud) and limited to program files, but you can bypass CLOAD? by LISTing on the destination display. You also have full control of the directory of source and destination disks.

Control codes or delimiters may prevent data file transfer. Sequential files should give no problems, but random files require the RS-232 interface connection. Once fitted it replaces the cassette connection described above.

Hardware Problems

The cheap homemade ribbon cables we make to connect printers to the Model I do not fit the Model III because the hole in the underside of the Model III is too small. You need the special Radio Shack cable with one small and one large connector if you do not want to cut the Model III case.

Only the outside diameter of the cassette cable cylindrical plug end piece varies (Model I uses plastic and Model III uses thinner metal). Remove the plastic entirely from a Model I cable; you lose the locator key but the plug only fits one way around in any case, usable on either Model I or III systems.■

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Draw a bead on this inexpensive light pen.

The Straight Shooter

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An article in *80 Microcomputing*, April 1980, titled "Build a Light Pen," by Wayne Holder, got me interested in using this peripheral. I had seen ads for a light pen for about $20 but it had what I considered a major drawback. To operate, it required that your cassette player be used as its amplifier. After reading the article by Holder, I considered building my own light pen.

Before I could get the needed parts, I saw a surplus "electronic six shooter" in a catalog. It comes with a circuit diagram. This, I thought, would have most of the parts I needed and was only $3. I ordered this gun along with two other parts: a five-pin DIN plug with five feet of five-conductor cable (one a shield) for 75 cents, and nine-volt battery clips at 10 for a dollar.

The Conversion

I was surprised to find that only one small change to the

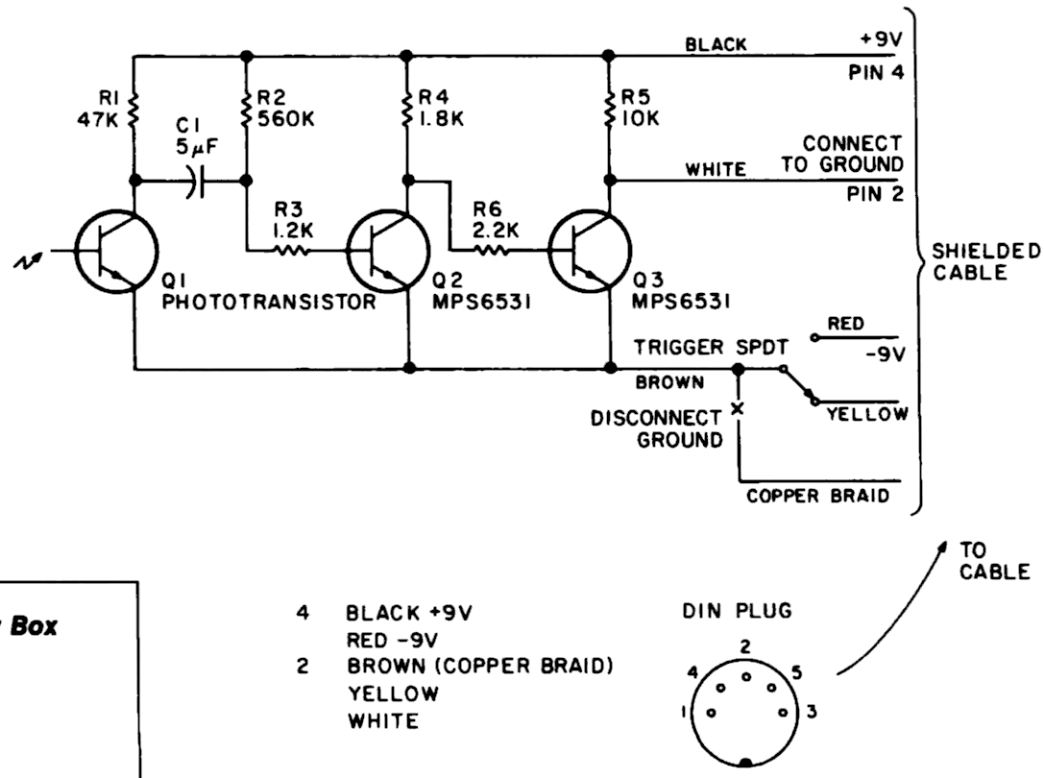


Fig. 1. Modified circuit diagram showing DIN plug connections and wiring changes.

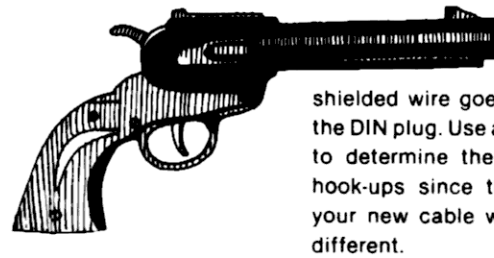
The Key Box

Basic Level II
Model I
16K RAM

wiring diagram was needed to convert the gun into a light pen. To make the conversion, first remove the two screws holding the brown handle grips. Using a heat gun with a plastic cutting tip, you can cut away enough plastic between the two screw holes to make a cavity large enough for a nine-volt battery. The brown grips will then enclose the battery.

Remove the other four screws holding the gun halves together. The trigger mechanism has two springs plus a moving contact. Be sure to observe their location. Also visible is a phototransistor mounted separately, and two lenses. Remember their positions.

Attached to the circuit board is a five-inch cable that has been cut off near the handle end. The only change necessary is to wire your new cable to the circuit board differently. You have to remove the five-inch cable so you can attach the five-pin DIN plug with cable anyway, so the change is effortless. The change made is shown in the modified circuit diagram (Fig. 1). Using the wire colors of the attached five-inch cable as a guide, the change is this: The copper braid of your new cable no longer goes to the point marked trigger, but should be connected to the place where the white wire was connected. Make sure the shielded wire goes to pin 2 of the DIN plug. Use an ohm meter to determine the proper wire hook-ups since the colors of your new cable wires may be different.



Make the other connections as shown in Fig. 1. Note that with the negative lead of the battery clip going to the location labeled red, you have a built-in switch. When you cock the gun, your light pen is turned on. Cut the hole in the inside handle for your battery, along with a hole in the bottom of the handle between the two gun halves for the cable, put your gun back together, and you are finished.

Next, plug the light pen into the cassette input on the CPU, load a software controller, cock the gun and you are up and running. I won't give you a new light-pen routine since many have been published. Wayne Holder's article gives a good routine. As an example of its use, I have included Program Listing 1, which builds on Wayne's light-pen subroutine. I have made some modifications to it. The delay given in line 9510 is all that is needed with this light pen. The example I have given places targets randomly throughout the video.

This light pen gives good contrast when the screen is adjusted. Since the pen has a focused lens system, it works successfully from right up at the screen to about 15 inches away. It even works with targets as small as one pixel or even a colon, though you must get closer to the screen. I couldn't program the gun to operate fast enough using the trigger to shoot at the target. If someone else can, I'd be happy to hear from them. Send me an SASE and I'll be glad to answer any questions. ■

(The six shooter is available from John J. Meshna, Jr. Inc., P.O. Box 62, E. Lynn, MA 01904)

```
10 'EXAMPLE OF LIGHTPEN TARGETS
20 'BY THOMAS L. QUINDRY
30 DEFSTR A-Z
40 DIM LST(12)

'DETERMINATION OF TARGETS
50 CLS
60 X=5
70 N=1
80 X=RND(5)+3+X
'SET UP HORIZONTAL DISTANCES FOR
TARGETS
90 LST(N)=X+( RND(15)-1)*64 'SET UP VERTICAL DISTANCES
100 IF X>50 THEN LST(0)=N: GOTO 130 'MAXIMUM HORIZONTAL LIMITER
110 N=N+1
120 GOTO 80
130 GOSUB 9000
140 GOTO 50

'LIGHT PEN SUBROUTINE
9000 L=LST(0)
9010 C$=CHR$(143) 'C$ CAN BE MORE THAN ONE CHARACTER IN LENGTH
9020 B$=STRING$(LEN(C$)," ") 'SPACES EQUAL IN LENGTH TO C$
9030 FOR I=1 TO L 'DISPLAY TARGETS ON SCREEN
9040 PRINT @ LST(I), C$;
9050 NEXT
9060 GOSUB 9500 'GO TO LIGHT PEN ROUTINE UNTIL GET SIGNAL
9070 IF LP=0 THEN 9060
9080 SCAN=1
9090 PRINT @ LST(SCAN), B$; 'FIND TARGET POINTED TO
9100 GOSUB 9500
9110 IF LP=0 THEN 9150
9120 PRINT @ LST(SCAN), C$;
9130 SCAN=SCAN+1
9140 IF SCAN<=L THEN 9090 ELSE 9030
9150 PRINT @ LST(SCAN), C$; 'BLINK TARGET TO DOUBLE CHECK
9160 GOSUB 9500
9170 IF LP=0 THEN 9060
9180 CNT=2
9190 PRINT @ LST(SCAN), B$;
9200 GOSUB 9500
9210 PRINT @ LST(SCAN), C$;
9220 IF LP<>0 THEN 9080
9230 GOSUB 9500
9240 IF LP=0 THEN 9060
9250 CNT=CNT-1
9260 IF CNT<>0 THEN 9190
9270 PRINT @ LST(SCAN)-2,"=>"; 'POINT TO TARGET SELECTED
9280 PRINT @ LST(SCAN)+LEN(C$),"<="; 'OVER BY LENGTH EQUAL TO C$

9290 FOR N=1 TO 1000 'SHORT DELAY AFTER TARGET FOUND
9300 NEXT
9310 GOSUB 9500 'WAIT FOR LIGHT PEN SIGNAL TO GO OFF
9320 IF LP<>0 THEN 9310
9330 RETURN

'IS LIGHT PEN ON OR OFF?
9500 OUT 255, 0
9510 FOR Z=0 TO 1
9520 NEXT
9530 LP=( INP(255)AND 128) 'LIGHT PEN SIGNAL IS ZERO IF OFF

9540 RETURN
```

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A look at CornSoft's utility to enhance Level II Basic.

ENHBAS

Ronald H. Bobo
3246 Gravois
St. Louis, MO 63118

When upgrading from a tape to a disk-based TRS-80, I missed the speed of Microsoft's Level III Basic which does not work with Disk Basic. Level III is a cassette-based utility which extends the powers of Level II Basic on the TRS-80 Model I. Level III provides most of the Disk Basic commands and functions for tape-based systems, with some extras. One of the Extras is fast graphics. If you have ever waited for Level II's graphics, Level III's graphics seem lightning fast.

Enter ENHBAS (pronounced EN-base), a graphics feature similar to Level III's, and more. It comes in both tape and disk formats, and versions are available for the TRS-80 Models I, II and III.

Philip Oliver—president of the Cornsoft Group, Indianapolis, IN—wrote ENHBAS. The Model I and III versions are attractively packaged in a three-ring binder with 38 pages of documentation for $59.95 on either tape or disk. The 64K Model II version is similarly packaged with more than 40 pages of documentation for $99.95.

Disk ENHBAS comes with versions for 32K and 48K machines on a transfer disk with no operating system. To initialize, the transfer disk is booted and after checking your memory size, automatically loads a special utility program along with the proper version of ENHBAS.

Upon receipt of a prompt, the transfer disk is removed and either a TRSDOS or NEWDOS system disk with at least four grans of space is inserted. Enter is pressed and ENHBAS will be dumped onto the disk.

The tape version is loaded like any System tape.

The disk version of ENHBAS uses high memory, while the tape version uses low memory. Thus, only one tape version is needed for all memory sizes from 16K-48K.

Model III owners are provided with ENHBAS on a formatted disk. Since the common configuration for Model III is two disk drives, you only have to copy ENHBAS onto a system disk.

During use of ENHBAS, Clear acts as a control key, and most standard control functions are supported. If a lowercase modification is present, Clear, in conjunction with the numbered keys, provides special characters such as brackets.

Upon initialization, a test is made for lowercase and if it is present, input-output drivers are altered accordingly.

Several features of ENHBAS make use of sound, provided a suitable amplifier is connected to the cassette output jack. With the amplifier on, a click is generated whenever a key is pressed. This audio feedback is said to be conducive to faster typing. The click may be disabled with a POKE. Errors return a short two-tone beep. The Break or Control C returns a sharp, high-pitched tone. Control G, or Bell, may be enabled with a POKE. When it is pressed, you don't get just a bell. Would you believe Winchester Chimes?

Who among us will stand up and say he has never typed LPRINT or LLIST with no printer enabled? This need no longer be catastrophic. After waiting about six seconds, ENHBAS will generate an error message. The system will not hang—everything returns to normal after the message.

The cursor character may be changed by POKEing the desired ASCII value into 16419.

Thirty-five shorthand entries are provided. By pressing a combination of Clear, Shift and a letter or number simultaneously, a Basic key word is generated. While saving keystrokes, this is a bit cumbersome.

For some reason, the H key is undefined. Initially, I thought this was for user customization. If so, I was unable to find it documented. Choice of implemented key words could also be better. Many keys are dedicated to special ENHBAS key words and some lesser-used Disk Basic functions (MKD). Some common key words are omitted; for instance: GOTO.

Find is used to locate the first occurrence of a line label in a program. Labels may be used instead of line numbers for jumps.

Renew will recall a program NEWed by mistake. In some cases, it will even recall a program after going to DOS and returning, as long as the number of files is the same as those previously allocated. Renew and Find are used in command mode.

Key and Tag are used to set up sorting arrays. Sorts, one of the most powerful features of ENHBAS, are handled through numeric and string arrays singly dimensioned. Key designates the array to be sorted; Tag designates arrays carried along with the Keyed array. For example, when sorting a mailing list by zip codes, Key would designate the zip code as the primary array to be sorted and Tag would designate the name and address arrays to be carried along.

Sort (0) or Sort is the key word used for a normal sort, small to large. Sort (1) will cause the array to be sorted in descending order. The command SCLEAR must be used before Keying and Taging. The simplicity of sorting is shown in an example from the

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"ENHBAS would appear to be an excellent utility for serious programmers."

ENHBAS manual (see Program Listing).

Note line 80 specifies keys from least precedence to greatest precedence. If one wanted to sort on the zip code as the primary key, the order would be:

```
KEY NF$,NL$,ZP
```

Atop denotes the top sort limit. If you want to sort up to a limit in an array, Atop sets the limit.

Being extremely interested in fast sorts, I wrote a short program to generate 1000 random strings, then sort them into alphabetical order. The sorting portion took only fifteen seconds! That's fast in anyone's language.

Several branching commands new to the TRS-80 are contained in ENHBAS. JNAME defines a line label, referred to instead of a line number. To accomplish this, GTO and CSUB, special forms of GOTO and GOSUB, are used. For example, 40 JNAME "PROCESS PAYROLL" could be accessed either by GTO "PROCESS PAYROLL" (or CSUB "PROCESS PAYROLL"), or by the more common GOTO 40 (or GOSUB 40).

The last GOSUB or CSUB is removed from a stack by POP. RDGOTO (used with a line number) and RDGTO (used with a string expression denoting a line label) are similar commands. Either will allow restoring at any line, rather than having to restore to the first data statement.

While and Wend, usually seen in compiler or structured Basics, are present in ENHBAS. These commands, always used together, allow setting up a loop without using GOTOs. For example, you might have a line such as this:

```
10 WHILE X > 1::PRINT X::X = X – 1:WEND
```

If starting with a value of 10 for X, the loop would be executed nine times, until X becomes one and drops to the next line. While or Wend statements, need not be on the same line. Any number of lines may intervene, and the code between the two statements will be executed once for each pass through the loop. A word of caution: These commands would not work with DOSPLUS 3.3D, although performing flawlessly with NEWDOS-80.

Draw uses codes contained within an integer array to draw turtle graphics on the screen. An example drawing a simple octogon shape is given in the manual. Once the array is set up, only one corner of the figure need be specified for proper placement. ROT rotates the figure on the screen by some specified amount. Scale increases the size of the figure.

Plot draws or erases a line or box between any two specified points on the screen. For instance, 10 PLOT S, 0,0 TO 127,47 draws a line from the top left to the bottom right corner of the screen. A box with the coordinates representing opposite corners is drawn by PLOT SB. The set flag is S, R reset, SB setting a box, and RB resetting a box. The first set of coordinates in a statement may be replaced with the up arrow. This indicates the Plot begins at the end of the last Plot. All these graphics commands are very fast, approaching Assembly program speed.

For special effects, Invert takes all graphics characters, including blanks, and turns white to black and black to white. Alphanumeric characters are not affected.

Left scrolls the entire screen left one space each time it is executed. Everything will scroll off the screen to the left when you enter 10 FOR X = 1 TO 64: LEFT: NEXT X.

CLM allows setting the width of the lines on your printer from 7-255, and Page sets the maximum number of lines to be printed per page. Page and CLM are not available on the Model III.

WPOKE is a two-byte POKE, allowing both a high and low byte to be POKEd into memory simultaneously. WPEEK returns a two-byte memory address, and is equivalent to PEEK (X) + 256 * PEEK (X + 1).

Scroll protects a designated number of lines on the screen from scrolling. Ever wish you could have a stationary heading with the rest of the screen scrolling underneath? Well, now you can.

Exec allows execution of a string expression as if it were a program line. This could be very handy, as when substituting a string for a short subroutine.

By use of Output, information can be routed to either the screen or the printer.

One of the more powerful statements, ZSTEP, allows pausing between execution of every program statement. Hitting any key during a pause causes the next statement to be executed. What a debugging tool this could be!

A couple of new constants have been added. PI returns the value of Pi, and EN returns e (base of the natural log). Both these constants are limited by the precision of the statements. They may be either single or double precision.

BIN$ returns the binary equivalent of a decimal number in string form, expressed as 16 digits. HEX$ converts an integer expression to a four-digit hex string.

Similar in effect to INKEY$, WINKEY$ loops automatically until a key is hit. No longer must you type 'IF A$ = " " THEN 10'. A simple ' 10 A$ = WINKEY$' is all that is needed.

Call allows the calling of a machine language routine without having to define an address. Integer parameters may be passed both ways.

EVAL is an enhanced form of VAL. It takes a string expression or literal, evaluates it, then treats it as an algebraic expression. A equal to 13 would be set:

```
10 X = 3
20 A$ = "X*X + 4"
30 A = EVAL (A$)
```

Several new error messages, necessitated by the ENHBAS commands, are included. The tape version of ENHBAS, in addition to the new features, brings some of the features of Disk Basic to tape users. Included are MID$, INSTR, and Lineinput. Also, &H, &O and &B allow the use of hex, octal or binary constants in numerical expressions.

All in all, ENHBAS would appear to be an excellent utility for serious programmers who need more programming power than the available Disk Basic versions can provide. Even for just-for-fun programmers, it's not all that expensive. I would definitely recommend it to anyone who is nostalgic for the fast graphics enjoyed back in the tape days with Level III Basic. ■

```
10 'THIS EXAMPLE WILL SIMULATE A MAILING LIST SORT
20 'NL$( ) is the LAST NAME array
30 'NF$( ) is the FIRST NAME array
40 'AD$( ) is the STREET ADDRESS array
50 'ZP( ) is the ZIP CODE numeric array
60 '
70 SCLEAR                 'INITIALIZE KEY/TAG
80 KEY ZP,NF$,NL$         'KEY ON LAST NAMES PRIMARILY,
90 '                        DEFAULT TO FIRST NAMES IF
100 '                       DUPLICATE FIRST NAMES, AND
110 '                       DEFAULT TO ZIP CODE KEY IF
120 '                       ENTIRE NAME IS THE SAME.
130 TAG AD$               'TAG STREET ADDRESS
140 '
150 SORT                  'SORT 'EM!
```

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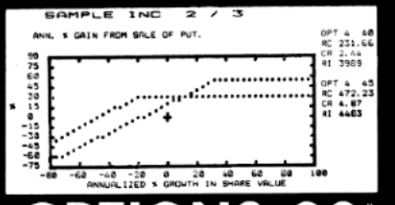

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As we promised, here is the phantom Fig. 11 to complete Elliott Rand's Real World Interface, Part III (December 1981, *80 Microcomputing*). Part I appeared in October and Part II ran in November.■

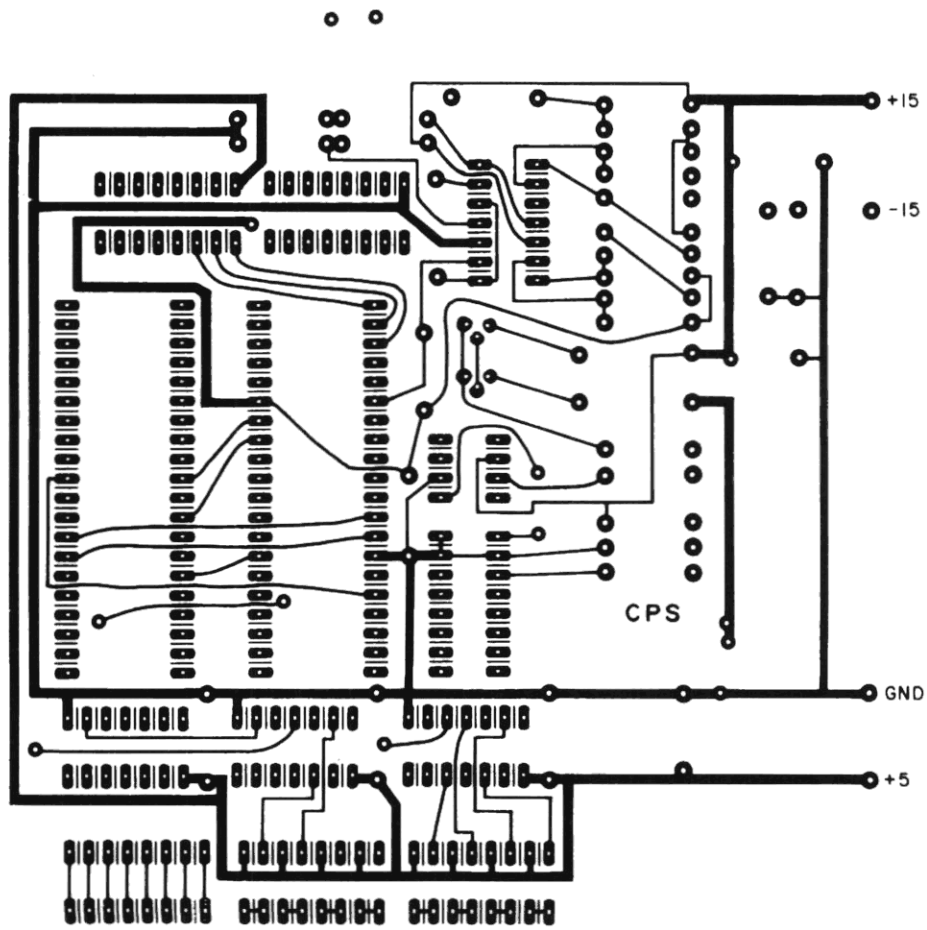

Fig. 11a. Component side of pc board.

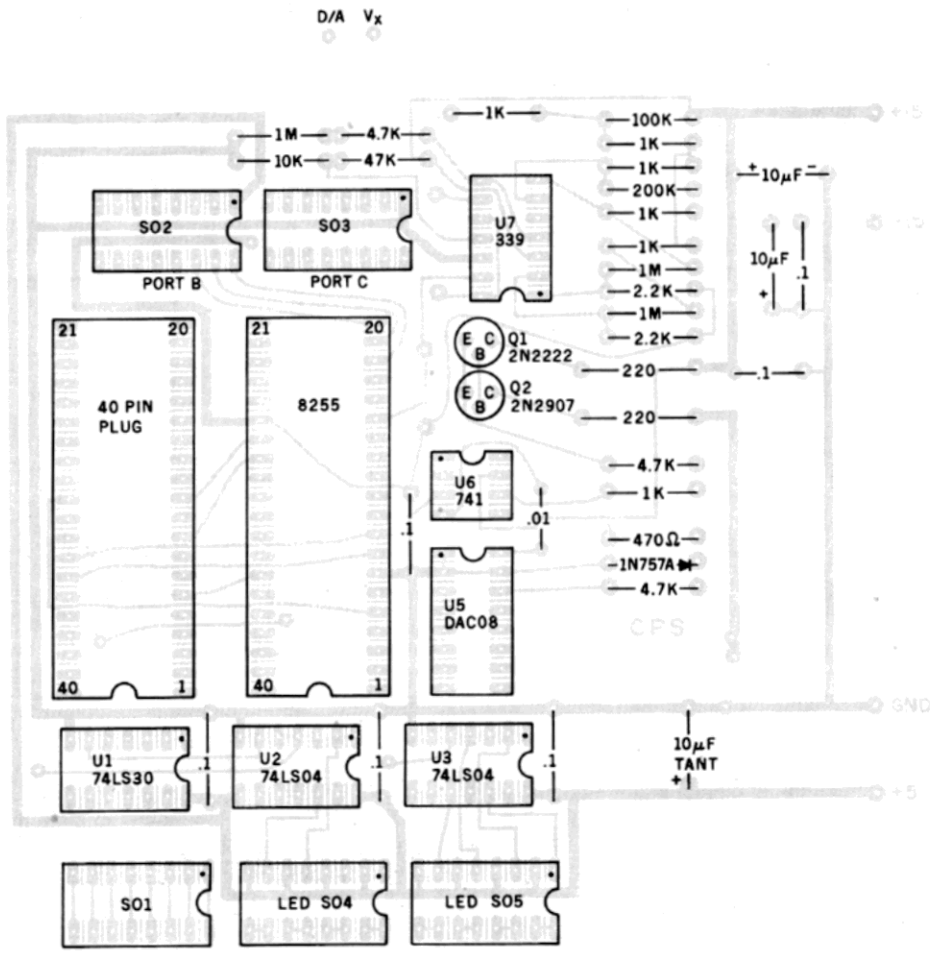

Fig. 11c. Component placement on pc board (Overlay of Fig. 11a).

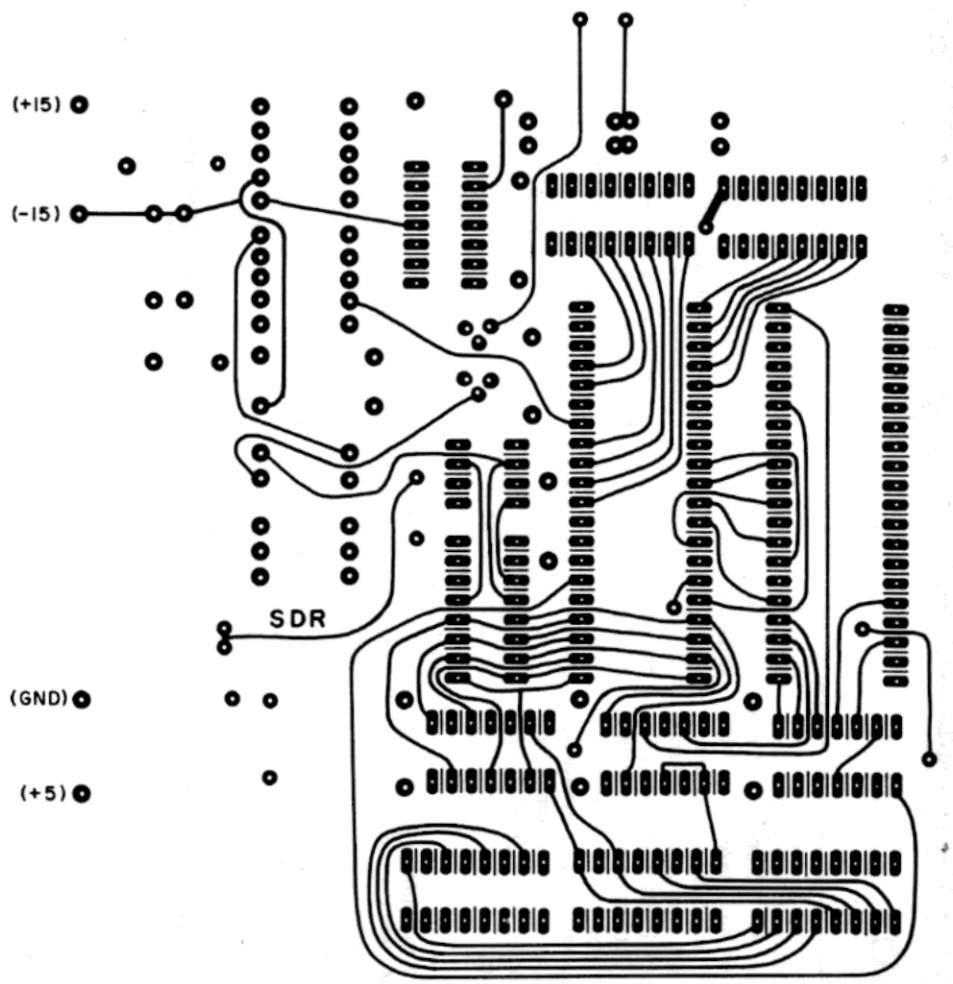

Fig. 11b. Reverse side of pc board.

 Continued from page 51

have full, two-way communication.

My modem works 100 percent of the time on my phone line. I have had no interference at all. If you have a party line or multi-line phones, you may experience some interference in the form of misprinted screen text. Data transfer may be less than perfect. If you live in an area with poor phone lines and you always have bad connections, your computer communications will suffer as much as your voice communications.

Warning

A warning seems appropriate here. Be sure that the Modem I is compatible with the system you wish to hook up to. The Source, CompuServe and TRS-80 to TRS-80 are all fine, but you may have a special purpose in mind. RS-232C compatibility does not guarantee modem compatibility. Contact your intended host and arrange for such things as baud rate, word length, parity, number of stop bits and who will originate or answer. If you use a cassette, the adaptations will have to be made at the other end. If you have an RS-232C you can make some adjustments at your end on the RS-232C board DIP switch.

Software/Hardware

If you have an RS-232C then you have all the cable and software you need. If you want to get CompuServe you will have to buy a $25 software package which includes one free hour of on-line time, ID number and secret password. This program is on tape and is compatible with disk. Also, Modem I can be used with Model III.

If you go cassette you have to buy a cable to connect your keyboard to your modem. Also, you will need a different software package. This is still in the $25 price range. I have not seen cassette operation.

It never fails that there is at least one hitch in every operation. This one is minor. Early advertising stated that the Modem I would handle a baud rate of 600. During production it was found that this was not possible. The Modem I now has 0-300-baud capability. Three hundred baud is what CompuServe uses, and it is fast enough for normal use. Most other host systems also have 300-baud capability.

Did Radio Shack finally do something right the first time? It appears so. My Modem is the most interesting and useful investment I have made for my TRS-80. Getting out of the house with the TRS-80 has been a dream and now it actually works. ■

Orchestra-85 (Model I)
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by Jim Heid

When Software Affair introduced the Orchestra-80 music synthesizer last year, they set standards of price and performance that made Orchestra-80 the most popular TRS-80 synthesizer available. There are more Orchestra-80 systems in use than any other TRS-80 synthesizer. Many computerized bulletin board systems offer free downloading of Orchestra-80 music files, with some systems containing as many as 60 songs.

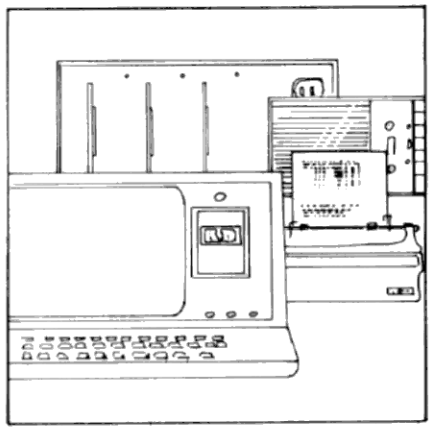
Software Affair has just redefined the standard. With the introduction of Orchestra-85 and Orchestra-90, they have again proven themselves as a company that produces well-designed, well-built, reasonably priced products.

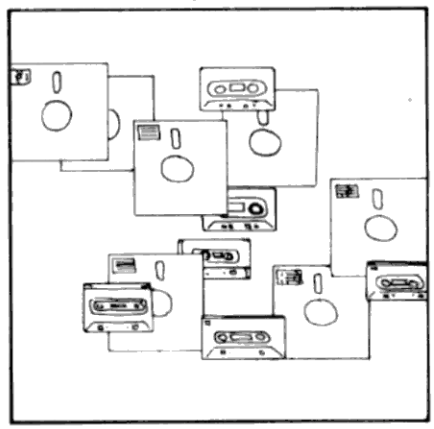
Orchestra-85 is downward compatible with Orchestra-80; Orchestra-80 files will load and play in stereo automatically, but Orchestra-85 files that use the new stereo and voice-altering features will not work on the Orchestra-80 system.

The Orchestra-85 system consists of a machine-language program and a small circuit board. The new system maintains all the features of Orchestra-80 (see *80 Microcomputing* Reviews, May 1981, page 30), and adds many new features, including stereo sound, percussion, optional fifth voice, new editing features, and improved sound quality.

The Hardware

The Orchestra-85 hardware is a 2-1/4 by 3-inch circuit board containing nine ICs and two RCA-type phono jacks. The board plugs into the rear of the TRS-80 keyboard or into the expansion interface's bus extension. No warranties are voided, since no covers need be removed. The board is connected to any external stereo amplifier using two standard (RCA) cords (not included). It requires no additional power source and can be left in place when not in use.





The Software

The Orchestra-85 software is a machine-language program that requires a minimum of 16K of memory. About 8K of memory remains for music entry in the 16K Level II tape version. Both tape and disk versions are supplied on a high-quality cassette that loads easily. The program consists of five major parts: a digital synthesizer, a music language compiler, a text editor, a file manager and an initialization routine.

The synthesizer features a six-octave range and either three, four or five simultaneous voices. The three-voice synthesizer will give the best sound quality, while the five-voice synthesizer should only be used with TRS-80s that have had a high-speed CPU clock modification installed. A high-speed CPU mod will improve the sound of any of the three synthesizers.

The synthesizer voices are pre-programmed to simulate, with marginal accuracy, a trumpet, an oboe, a clarinet, and an organ. A voice may also be defined as percussive to add percussion and rhythm

effects to a song. Any voice or voices may be altered at any time within the music file. The addition of percussion and the ability to change the tonal qualities of the voices within any file are new features, ones that greatly expand the creative capabilities of the system.

Orchestra-85, like its predecessor, uses a symbolic language to enter musical pieces. In this language, a hexadecimal-like sequence of numbers and letters represents all the notes within the system's range. A few other letters and characters are used to specify key, tempo, voice and note value. The language works well and has the capability of producing a wide range of musical effects.

The compiler will accept music written in any key, any time signature, and any note value from whole to sixty-fourth notes. Notes may be single, double or triple dotted, or played as triplets. Accidentals, staccatto and pizzicatto note forms are also available. Two forms of articulation are provided, as are the capabilities for repeats, second endings (with or without retard), and modulation.

The compiler scans each number, letter and character in the text file and checks it for legality. If an illegal character is found, compilation stops and an error message is displayed in the status lines. If the character is legal, the compiler generates the necessary machine-language instructions to synthesize the note. The compiler is fast—an 8,000-character file compiles in under 14 seconds.

The compiler is accessed with the Score command. Another command, Get (filename), reads a file from tape or disk, Scores it, and plays it. The Get command can also read, score and play more than one song at a time. This is accomplished by entering Get (file1) (file2) (file3). . . . The program will read the first file from tape or disk, score it, play it, then repeat the procedure for the other files. When all the files entered have been played, the program returns to its command mode.

"The. . . text editor is one of the system's best features."

A new command in the disk version, Multi (file1) (file2) (file3). . . , is described by the manual as a "perpetual Get". The Multi command performs the same function as Get, except that the program returns to the beginning of the Multi command when all the files have been played. This allows repetitive playing of a group of songs.

The initialization routine allows the user to custom-configure the program to his or her system. The routine first asks the user whether or not a fast clock modification has been installed. If so, the user is prompted to enter the enable and disable codes. The routine than asks how many voices are desired. The user responds with three, four or five. The user then has the option of saving the altered program, eliminating the need to go through the initialization dialogue in the future. The disk version adds the extension "/CMD" to the user-selected filespec.

"Software Affair has kept up their tradition of fine documentation."

According to the manual, the Multi command is "useful in background music applications." I personally like soft "elevator music" for background music; but there are probably some types that would prefer a computer synthesizer. I cannot picture a romantic evening consisting of some fine wine, soft lights and the mellow strains of a 16K Level II TRS-80.

The Orchestra-85 text editor is one of the system's best features. The text editor provides a 14-line text display area and a two-line status display area. The status lines are located at the top of the screen and are used when entering system commands like Score, Get and Play. Error messages are displayed in the second status line. The text file scrolls up and down below the status lines, and a blinking block cursor can be positioned anywhere in the file by using the arrow keys on the keyboard. The program fully debounces the keyboard, and all keystrokes repeat when held down.

Additional text editor features include insert or delete line, and a global character string search. A new string-search feature is the ability to search in front of or behind the current cursor position. By using the List command, the contents of a file may be sent to a line printer, and the computer will not lock-up if a printer is not available.

The file management system is a powerful text file manager that provides for orderly storage and retrieval of user files on tape or disk. The tape version uses a six-character filename and the disk version supports an eight-character filename, with the extension "/ORC" added automatically. By typing "D" or "DIR", a directory of all files with the /ORC extension can be displayed.

New features of the disk file management system include double-density support, the ability to kill files from the command mode, and an Append command that combines separate music files.

Users of Orchestra-85 will notice that there is no provision to alter the voices in the initialization routine. This, as mentioned earlier, is because any voice can be altered within a file as many times as needed.

Software Affair has kept up their tradition of fine documentation. The 43-page manual is nicely typeset and printed and provides full instructions on set-up and use of the system, including an expanded section for non-musicians on reading sheet music.

Registered owners of Orchestra-80 may upgrade to Orchestra-85 by sending their system to Software Affair with $69.95 plus $2 shipping. I recommend upgrading —the stereo and the improved sound quality of Orchestra-85 are worth it in themselves.

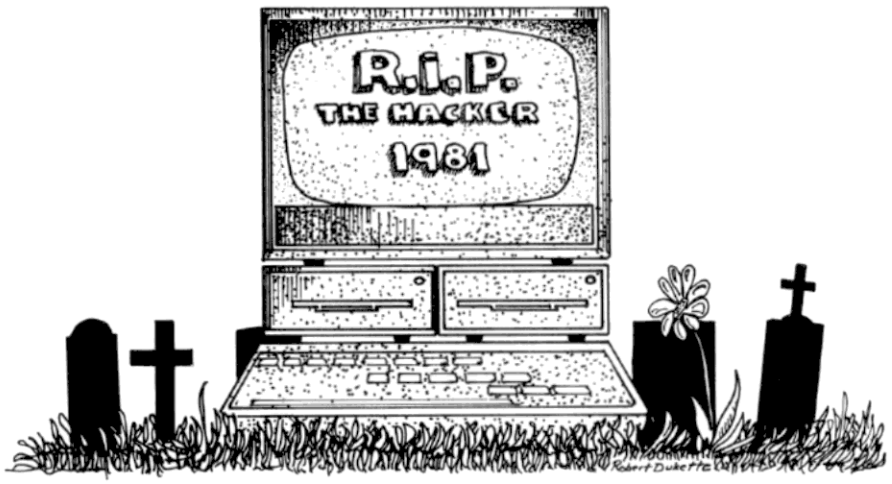
There is one area of the system that I hope a future version will improve. It would be much easier to enter music if the screen was turned into a musical staff—each note could then be entered just as it appears on the sheet music. While the graphics capabilities of the TRS-80 are limited, some creative programming could undoubtedly solve the problem. And Jon Bokelman has proved himself a creative programmer.

Orchestra-85 is, however, a step forward in TRS-80 music synthesizers, and remains the best buy in computer music systems. The addition of stereo adds, literally, another dimension to the music, and the ability to alter the tonal qualities of the voices within a file extends the creative capability of the system. The key to realizing these capabilities is to learn the system as thoroughly as possible.■

VIEWPOINT

Top brass blow taps for hackers

by Chris Brown
80 Micro Staff



A funny thing happened during the course of this forum. The computer hacker passed away.

A common theme sounded from an evening symposium conducted by the Boston Computer Society entitled, "The Future Of Personal Computing." It is that the age of the hacker is coming to a close. The symposium—an executive bull-session that has come a tradition at the Northeast Computer Show—is usually entertaining and informative.

This year, industry executives conjectured about what the future bodes for the personal computer marketplace. Representatives from Atari, Commodore (PET), IBM, Microsoft, Apple, Tandy and Sinclair analyzed where the industry is headed. The consensus was that hardware will be easier to use and software will be virtually transparent in the years to come. The microcomputer's appeal to non-technical users will increase at the expense of the hard-and software hacker.

Potato chips and pet food

Lead-off speaker James Finke, president of Commodore International, reminded the audience that the personal computer market generates about the same yearly revenue as the potato chip industry in the United States. He speculated that, should growth continue at present levels, personal computers will soon compare favorably with the lucrative pet food industry in dollar volume terms.

Envision the future of the personal computer—a machine he described as having one user, a very low cost, and a home, school or small business environment. Finke outlined his expectations: "We will soon eliminate the high priest in personal computer applications. We will also make the user-computer interface transparent by simplifying the lexicon of the technology."

Finke also said manufacturers will change their ways of thinking very soon. "Our customers are now everyone," he said. "We must demonstrate to these people the value of the technology, demystify it, and provide a wider range of services. Finke expects to accomplish all of this by expanding the role of the dealer. For him, there will be no technical Taj Mahals in the new computer society.

The young millionaire

In a rambling dissertation on the software industry—past, present and future—Bill Gates, 25, the youthful president of Microsoft, offered his view of things to come. Gates, often described as "a young millionaire" by the computing press, felt the biggest event happening today is the switch from 8-bit to 16-bit machines. In his opinion, the new 16-bit machines will be infinitely easier to use and eventually will *eliminate* the hacker. In addition, Gates sees multi-purpose machines like the Xerox Star providing the most economical, and therefore realistic, alternative for tomorrow's users.

Gate stressed the importance of making the user feel "at home" with his machine and added that the incredible freedom provided by 16-bit instruction sets will allow tomorrow's user to be a creative programmer without becoming a techno-freak. Common English words and phrases will constitute the programming language in the 16-bit future, according to Gates.

After exceeding his 15 minute time limit by a factor of two, Gates was restrained by moderator Jonathan Rotenberg and concluded by saying companies like his will work towards these goals with greater aggressiveness in the future.

Microsoft, incidentally, authored the Basic interpreter for IBM's new 16-bit personal computer.

Come out of the closet

Echoing a popular theme, the man from Atari announced that the personal computer is coming "out of the closet." Director of Development Peter Rosenthal, standing in for absent Atari president, Rodger Badertscher, said the machines of tomorrow will be easy to use, easy to buy and easy to sell. Rosenthal quickly put his audience of hackers on the defensive by asking rhetorically, "*Who* will buy the

computer tomorrow?" Then answering his question he said, "Surely not this group!"

Pointing out the biggest dollar earner in microcomputer software history was Space Invaders, a rather mindless game garnering a healthy $2.5 million in sales, he speculated that entertainment software will be a major part of the personal computer marketplace of the future.

"You have to realize that not everyone wants to program a computer and that hobbyists no longer represent our major customers." His words describe Atari's latest advertising campaigns which stress the *fun* of the machine over business, scientific or educational applications.

Let's be user friendly

Onto this hostile rostrum stepped Radio Shack's John Shirley. Opening his well organized and humorous presentation, Shirley portrayed himself as a dropout who languished around the campuses of Boston for years before getting serious about computers and marketing. Shirley stressed the importance of hardware and software being "user friendly."

"User friendly" means always having help available when running a program by simply typing "HELP" on the keyboard. It also means errors are trapped instantly and prompts are frequent and easy to follow. For Shirley, properly written software of the future will require no written documentation. It will be totally *self*-documenting. Shirley cited Radio Shack's Arcnet package as an example of user-friendly software.

Shirley related the circumstances surrounding the placement of disk-equipped Model IIIs in all Radio Shack stores for interactive inventory control and up-dating. The machines are tied to Forth Worth by a cable network and will transmit daily store inventories to a mother computer after hours. Shirley cited an additional benefit of placing a functioning system in each store: "Our Staff will gain valuable experience by using this system."

Like Microsoft's Bill Gates, Shirley views tomorrow's machine as a diverse work station whose cost can be justified by the many types of things it will do. This appliance will require the user to do no more than follow the machine's lead.

After taking it on the chin for almost two hours, the Boston Computer Society's beleaguered audience of hackers heard more of the same from IBM, Apple and Sinclair.

The evening ended with the disheveled hackers, heads down, filing out of Hynes Auditorium, in mourning for their lost hobby.■

Aristotle makes cars talk

For a nation weaned on talking dogs and horses, it should have surprised no one to find a talking car at the Third Annual Northeast Computer Show in Boston.

Aristotle Inc.—headed by John A. Phillips who, while a student at Princeton, gained notoriety for designing an atomic bomb—outfitted a $29,000 DeLorean sports car with a talking microcomputer called Copilot.

The micro, attached by clips to a car's wiring, monitors 11 "vital" functions:

- Door left ajar;
- Fuel tank near empty;
- Brakes about to fail;
- Emergency brake engaged;
- Oil pressure low;
- Lights left on;
- Diesel engine not properly warmed up;
- Engine overheated;
- Keys in ignition;
- Seat belts unfastened; and
- Battery voltage low.

If any of those things apply to your car, a short key note chimes over the radio speakers and a female voice announces the malfunction.

Asked in a phone interview if Copilot only duplicated the monitoring lights that come as standard equipment in most cars, Phillips' brother Dean, who did most of the engineering on the project, responded.

"In many ways, it does. The advantage is it gives you the appropriate warning at the appropriate time. There are many times a person will drive along with their parking brake on and the parking brake light flashing in their eyes."

He added, "We thought about people saying, well, we have idiot lights that tell me that. My response is this is a much more effective method."

Dean Phillips has some company. The Navy uses the same technology in its F-14 carrier-based jets to run through a preflight checklist while a pilot is in the cockpit.

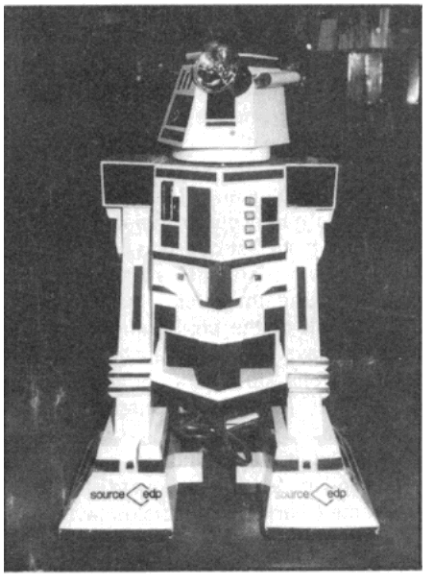
Why did the Phillipses choose a female voice for Copilot? "We wanted a voice that would cut through the noise environment of the automobile," Dean said. "It's not just any female voice. We interviewed a lot of voices and finally chose the one doing ads for Ma Bell. Her voice was the most appropriate and carried best in an automobile environment."

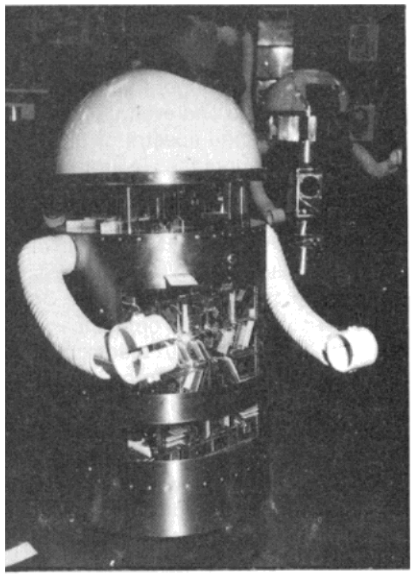
Whether or not Copilot will fly will be decided in the marketplace, but having an A-bomb designer behind it hasn't hurt. "It's been a positive thing," John Phillips said of his nuclear notoriety. "There's no question about it. It opens the door."

He added, however: "If we had come out with a poor product, it would not have helped that I designed the bomb. The fact is that Copilot can stand on its own."■

Robots have become de rigueur at computer shows. This pair rolled around the Third Annual Northeast Computer Show held Oct. 15-18 in Boston. Their favorite question was, "Are you a computer professional." One reporter replied, "No. I'm a peripheral."

photos by G. Bert Latamore





Silicon City showdown

by Chris Brown
80 Micro Staff

When the anvil of slothfulness is smitten, sparks fly in many directions. Now, some of those sparks have caught this town's attention," says Reverend Ronnie Yarber. The Bible-belting Baptist minister at the Gross Road Church in Mesquite, TX, went on to tell *80 Micro*, "Maybe electronic games aren't inherently evil, but the atmosphere created in those game parlors is a breeding ground for drugs, alcohol use, wagering and the like."

Yarber is not the only one in his city of 67,000 who feels this way. In an effort to check the pin ball craze in 1973, the community rallied enough support to pass a town ordinance prohibiting anyone younger than 17 from playing coin-operated games, unless accompanied by an adult. Lately, that ordinance is being directed against electronic game parlors. Mesquite's ordinance has a precedent, of sorts, in one passed in Pasadena, CA, and upheld in the U.S. Supreme Court in 1912. The issue then was pool halls not Pac-Man.

Although Mesquite is no rural backwater and its white, middle-class population lives in suburban proximity to the city of Dallas, it exhibits strong religious conservatism and fundamentalist beliefs. Mesquite is a "dry" town—one must leave its boundaries to buy a drink—and several years ago was the scene of another pitched battle involving youth and city ordinances. In 1979 the school dress code prohibiting hair longer than collar length was challenged and eventually upheld.

The worrisome spectre of this type of legislation haunts the electronic game industry as it senses lost profits and fundamentalist backlash to pay-as-you-play pastimes. In self-defense, a chain of game parlors called Aladin's Castle, has taken Mesquite to the U.S. Supreme Court to overturn the town's ordinance. Aladin, which operates 250 electronic game rooms around the country and is a subsidary of Bally manufacturing, has received the support of others in the electronic game industry.

Atari, a company which owes much of its success to electronic games, has filed an Amicus Curaie (friend of the court) brief in the case to persuade the justices of the Court that they have a bad case on their hands. Atari senior vice president and general counsel, Charles Paul, told *80 Micro* that, "the Mesquite case has serious flaws procedurally and, we feel, is not a suitable case for the court to rule on in this matter."

Atari has retained the legal services of Robert H. Bork, ex-U.S. Solicitor General (and Richard Nixon's hatchet man in the Saturday Night Massacre), to bolster its position. Atari hopes, in the words of Paul, "that the court will wait for a better case on which to rule in this important matter."

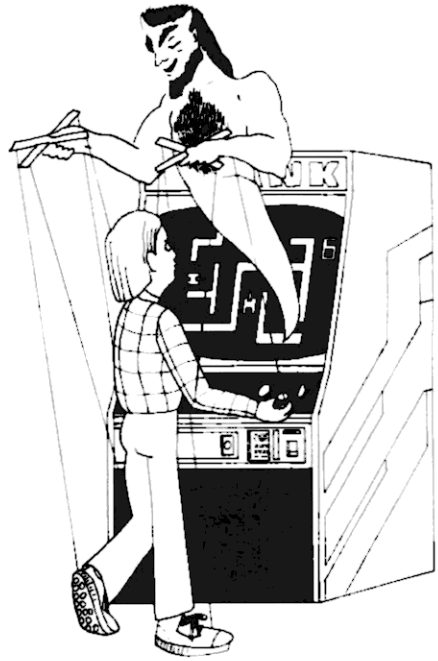
The case was heard in early November and a ruling is expected "sometime before June," according to Paul. He cites the fact the court spent 30 out of the 60 minutes alloted to the case sorting out procedural matters to prove that flaws exist in this case. He added: "The rights of the juvenile must prevail. Mesquite, Texas has gone too far in this case."

According to Mark Manroe, editor of the Mesquite *Daily News*, the electronic games issue is not that big a deal. "The issue hasn't aroused anywhere near the concern in the community that the R-rated cable tv channel did," says Manroe. Last year the concerned citizens of Mesquite banded together to force a referendum on the issue in which they voted themselves the right to watch R-rated movies on a local cable tv channel.

"Basically, I think that some of the city council members have strong religious beliefs. They feel that if they loose control on the electronic game issue that it might lead to the loss of control of age requirements in other areas too. They don't want this to happen and they are holding firm to see that it doesn't."

Reverend Ronnie Yarber sees the issue in a less political light. He feels that electronic game parlors encourage kids to spend their last quarters on one more game of invaders instead of a school lunch and undermine fundamental values. "The result of the proliferation of these places," says Yarber, "could be increased welfare rolls, food stamp applications and other federally sponsored social programs."

In Mesquite, the principles have taken sides and are awaiting the word of the U.S. Supreme Court. If the decision favors the pro-regulationists, real trouble could be coming for Silicon City. ■



Electronic games: "Not inherently evil" but still contributing to sin.

The wages of "sin" climb into millions

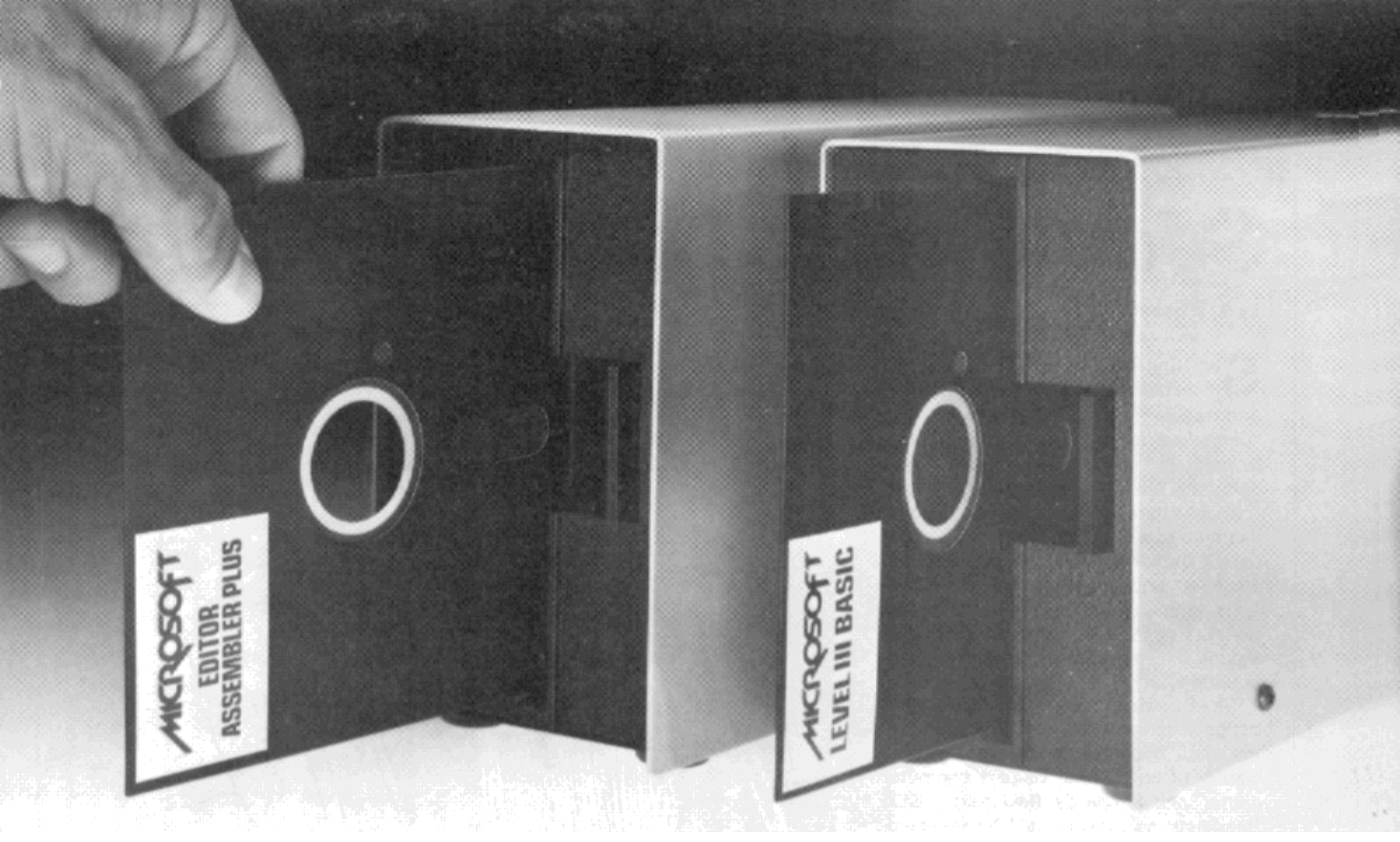
A recent New York *Times* business article pegged the total dollar volume of the electronic game industry at $5 billion a year.

By far the biggest money maker in the industry's short history is Bally Manufacturing's Pac-Man. This non-violent video game attracts female and male players in equal numbers. A Payne Webber report titled, "Video Games, A New Growth Industry," credits a large measure of the game's success to its non-combative format.

Introduced in October of 1980, Pac-Man has gobbled up change at a $1 billion a year rate. Bally's unit costs $3,000 and can be expected to garner between $200 and $400 a week in most settings. (Some units on college campuses regularly earn over $500 a week.)

Payne Webber analyst Lee Isgur claims an added bonus of Pac-Man is its long life. "Most electronic games earn progressively less over time with peak revenue returns in the first 10 weeks," asserts Isgur. "Pac-Man, however, holds steady as a rock."

Many business analysts these days think it's time to get a piece of that rock. ■



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Scouts in the computer room?

by G. Michael Vose
80 Micro Staff

Soon, the Boy Scout Oath may contain more than promises to be thrifty, brave and reverent. The list could include "dedicated to structured programming techniques" or "committed to efficient data base management."

Thanks to recent efforts by the national headquarters of the Boy Scouts of America, the Data Processing Management Association and the Association for Systems Management, young men in Boy Scout troops and Explorer posts all around the country are meeting the computer industry.

The Boy Scouts have offered a merit badge in computers since 1973. To obtain the merit badge, a scout learns a brief history of computers, visits a computer center and prepares flowcharts. BSA Headquarters provides a 30 page pamphlet packed with information that will secure the Scout a solid introductory education in computers.

The computers merit badge is a circular piece of cloth showing a punch card and a reel of magnetic tape. Earning the merit badge requires four to six weeks of study by an average scout. In addition to learning facts about the computer industy, the Scout discovers some career opportunities available in the field.

A scout earning the merit badge never touches a computer or learns programming, but he is exposed to flowcharts, an early step in the preparation of programs. He flowcharts the procedures for pitching camp, assigning a sequence of events, and implementing instructions to a fictional scout patrol. The steps include everything from preparing tent sites to digging a latrine and gathering wood for a campfire.

The pamphlet for the merit badge was prepared with the assistance of the Data Processing Management Association. It is well written and packed with information. It would suitably introduce computers to anyone. Scouts 14 and older should be able to understand the information but younger scouts may have some difficulty. The pamphlet includes chapters on computer history, computer terms, how computers store data, input-output systems, computer installations and careers in the computer field.

In the computer history segment the scout journeys to ancient China where he learns about the abacus. From there he travels to France to meet Blaise Pascal, then to America to meet James Hollerith and, finally, Ekert, Mauchy and John von Neuman. Along the way, the scout watches the computer evolve.

The chapter on careers in the computer field explores the role of the programmer, computer operator, systems analyst, design engineer and even the computer salesman.

In the chapters about computer terms, the scout learns the meaning of CPU (Central Processing Unit), register, microsecond, bytes, memory, subroutine, floating point and dozens of other "buzzwords."

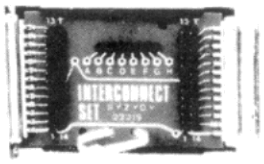
The Computer Programs chapter explains the difference between assemblers and compilers and the difference between source and object code.

Computers are catching on with scouts

Bill Andrews, BSA director of information services, said Scouts are anxious to learn about computers. At a national jamboree held last summer in Virginia, a booth on computing drew huge crowds. According to Andrews, "There were several Apple computers at the booth and the lines waiting to use each one were 10 to 12 scouts deep all the time." Andrews has been working with Dick Irwin, president of the Association for Systems Management to develop more sophisticated programs for the Scouts in the computer field. Recently, they teamed up to start Explorer Scout posts specifically intended to teach data processing and programming.

At BSA national headquarters in Irving, TX, an Explorer post uses BSA's IBM computer to learn COBOL programming and data processing. The Scouts meet twice a month and the programmers and operators who work in the BSA computer center teach them. At the urging of ASM, several local chapters of the association have also sponsored Explorer posts around the country to introduce older scouts to data processing. The goal of these organizations, said Irwin, "is to expose young people to career opportunities in data processing and information resource management."

If you work with computers, you may find a Boy Scout knocking on your door seeking information. It will be part of effort to earn a computer merit badge. Who knows, soon maybe scouts will be writing programs that help little old ladies across the street!■



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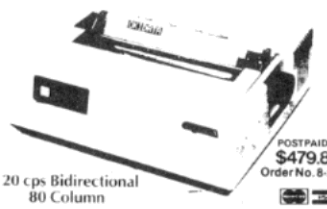

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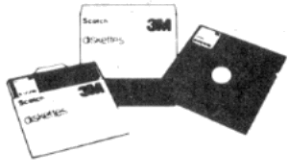

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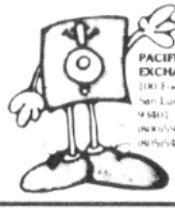

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He says he can compute fiction

by John P. Mello Jr.
80 Micro News Editor

I ate my leotard, that old leotard that was feverishly replenished by hoards of screaming commissioners. Is that though understandable to you? Can you rise to its occasions? I wonder. Yet a leotard, a commissioner, a single hoard, all are understandable in their own fashion. In that concept lies the appalling truth.

Bad poetry? Worse prose? Try computer fiction. Last September the science magazine *Omni* published "the first experiment in computer-generated science-fiction writing." "Soft Ions" (titled by the editors at Omni, not the computer) was written by a program called Racter developed by two computer hobbyists, William Chamberlain and Thomas Etter.

"The program is essentially an existence proof that such programs can exist," Chamberlain told *80 Micro*. "It is very, very far from being an idealized program—even one we would be more or less satisfied with."

"Racter as it stands," he added, "is an existence proof that a computer can compute character strings which we recognize as being English and to which we accord—on our own and individually—meaning or no meaning. One can't say that about *Moby Dick*."

What makes Racter important is its authors' claim that the program—operating on an Ohio Scientific Instruments Challenger II with 48K of RAM—writes a story without any nudges from the person running the computer. Artificial intelligence labs, using much more sophisticated hardware, have tried to do that for years with mixed results.

Chamberlain, now living in New York City's West Village, disclaimed Racter had anything to do with artificial intelligence—getting the computer to emulate human thought. "This does not think, nor does it replicate thinking vis a vis artificial intelligence work that is being conducted right now," he said.

Asked how his and Etter's program differed from AI experiments, Chamberlain explained, "This thing doesn't apprehend anything outside. This thing is doing its own thing inside. And it's doing it not contingent upon choice points outside in the real world. It's just cooking by itself."

The program, he said, is composed of dictionary files—made up of lists of words—and hierarchic files. These echo the dynamics and structure of language algorithmically. They tell the computer about clauses, subjects, objects, modifiers...the meter and resonance of language rather than its meaning.

"It turns out," Chamberlain said, "that if you come pretty close to this, then reason seems to be computed in some sense. That is, the computer takes off on

Continued on page 335

William Chamberlain

A pair of hackers shaped Racter

William Chamberlain, 41, coauthor of a program purported to write science fiction, admits he is a dabbler at computer programming. "I'm quite a dilettante at this," he observed, "but I've learned a lot over the past four years working on this project."

Born in the Chelsea section of New York City, Chamberlain has penned short stories, tv scripts and pulp fiction, and made blue movies as well as medical films for the University of California Medical School at Berkeley and the University of Minnesota Medical School.

Thomas Etter, according to Chamberlain, has 20 years experience with computers and holds patents in the field. Etter, who lives in California, is a quantum logician and systems designer.

During the New York World's Fair in 1962, Etter exhibited a hydraulic computer at the National Cash Register pavillion, before the device could get into the stream of things, the transistor rendered it obsolete. ■

Continued from page 334

its own and we have no idea what it is going to say and when it says something it appears to be quite sensible. You impart reason to it."

"The program," he observed, "fools around with words based on certain formalisms we have decided upon—the most important one, of course, is what formalisms one can extract from the English language.

"Once you've extracted certain shapes and forms and thrusts and parries of English, then give the computer some English words, conjugations, rules for pluralizing things, keeping track of gender, then it turns out it is able to compute English."

Chamberlain explained that words called identifiers define the relationships between words in the program. Fur could be an identifier, he said, and the computer would be told that if it chooses the word horse, it may use fur with it, but if it chooses "grand piano," it may not use fur.

"Now if you simply expand and expand upon that," the former tv writer and film maker said, "and make it more and more intricate and more and more complex, you will see that the computer can compute some very interesting things in the English language with nothing but a long list of identifiers to make choices from.

"That is what the program Racter does. It allows the computer to go into long lists of identifiers—which are character strings preceding every entry—according to certain formalisms: what is equal to what, what is very divergent from what. Contingent on that information, it begins to build word chains. And lo and behold, it begins to build up sentences."

Even though Racter has produced one story, Chamberlain and Etter are not ready to churn out more. Chamberlain explained that bugs in Racter and hardware limitations prevent another unique story being produced. "If you started the program now," he said, "the stories would be similar."

All the files can't be loaded into the OSI's memory at once, he said, so the choice points in the program are limited. So is what Chamberlain terms "depth of call"—the distance the program may depart from a point before returning to it. Now Racter has a depth of call of six to seven, he said, another factor that would contribute to the "sameness" of another story produced by the program now.

Also, Racter only works on the OSI, which limits its portability. The pair have purchased new hardware but are having trouble adapting Racter to it.

"As it stands now," Chamberlain observed, "it is a very buggy program. It takes an immense amount of idiosyncratic knowledge to get the thing working properly."

"We have limitations in the program," he said, "and we're working on a deficit budget here. We have some limitations that are very hard to get at and each of us have other things to do to make a living. We can't spend our time exclusively on this activity so it's hard to get certain bugs out of the program we would like to get out of it."

Omni helped Chamberlain and Etter with a substantial initial problem with Racter: translating it into machine language. "*Omni* gave us some money to pursue our work, "Chamberlain said, "namely, to get Racter into machine language because it was running too slow in Basic."

Asked about Racter's future, Chamberlain observed, "if we don't get some money, there's not going to be any future." But he added he hoped to publish a book of 13 computer-generated short stories in a "very intriguing and new kind of expressive fiction."■

Wang Lab struts its new stuff

by Steven Frann
80 Micro Staff

Wang Laboratories Inc., introduced several new product lines and announced enhancements to its existing product lines. The new products, the Alliance 250, the Audio Workstation, and the Image Transfer System, were announced at a press conference held at Wang's corporate headquarters in Lowell, Massachusetts recently.

The Alliance 250 provides data base computer power to all office personnel without requiring a knowledge of computers. It allows users to create a data base easily and to retrieve and format information instantly. It features the integration of data processing, word processing, audio processing, image processing and networking. Available software application modules include visual memory, document management, time management, and a message system.

The document management feature indexes all words in all documents with an average disk space overhead of only 15 percent. A typical application might search for information given in a speech stored as a document on the Alliance system. If the speech dealt with "the dynamics of advertising during a recession," entering the words "advertising" and "recession" would obtain an instant screen listing of all documents containing the two words.

The Audio Workstation provides voice messaging. Audio is available on Wang's newly unveiled 5300 Series Ergonomically Designed Workstations. The user creates voice documents through the Audio Workstation whose digital-based voice editor allows him to dictate, review and edit voice documents. A graphic of the voice message appears on the screen and aids editing.■

Will Racter put writers on the dole?

Should fiction writers start shaking in their loafers over Racter?

Coauthor William Chamberlain asserted computers will produce novels eventually. They will *look* different than anything a human being has ever produced," he observed, but they "could never have the mystery of writing."

"It could write junk novels," he added. "I think that's a possibility, although my colleague and opposite number, Mr. Etter, thinks that is not the case."

However, he said, "I don't think a computer will ever write literature."

Asked if "Soft Ions" reflected his writing style, Chamberlain said, "Many people that know me have said, Wow, Bill, it's saying crazy things, we don't understand it, but it sounds like you."

"The computer," he noted, "somehow seems to sound the way the person who has written the files sounds regardless of what the computer is saying."

He continued, "If this is indeed the case, then this particular program in some sense captures some aspect of a living person."

"Had Oscar Wilde started out with this computer," Chamberlain said, "and got some aspect of himself in it on a disk, then we could have Oscar Wilde talking to us now. It wouldn't be reasonable talk, but it would be ever changing and be some aspect of Wilde.

"That may be one of the most important things that such programming can do and there's no other modality around these days that can afford us that."■

Heed market, execs told

The electronic information revolution in the United States should not waste its resources on expensive gadgets and ignore the mass market consumer, a Radio Shack executive cautioned at the 96th Annual National Newspaper Association and Trade Show.

"We feel," Charles A. Phillips said, "if you approach this market with all the bells and whistles available to existing technology, then you will price yourself out of the mass market."

If you do that, the Senior Vice President for Special Markets reasoned, you will discourage the capital investment needed to spur the electronic information revolution.

In the United Kingdom, France and Canada, the governments make that kind of investment. Phillips added: "Only national and federal governments have the resources to squander on the luxury of technology first and the marketplace later. The shareholders of a private enterprise must use their dollars more wisely than that."

Phillips criticized American Telephone and Telegraph's proposed standard—patterned on Canadian and French technology—for two-way computer communication.

He explained Ma Bell ignores the United States standard for tv screens (32 characters per line, 16 lines per screen) and addresses the foreign standard (40 characters, 24 lines).

"We grant foreign tv gives better picture resolution," he said, "but how can one overlook the numbers? Ninety-nine percent of American households have tvs on the 32 by 16 standard. How do you expect to deliver information to the home if the homeowner cannot afford it, that is, if he has to make some costly modification to his tv set?"

Phillips assured the conferees Radio Shack could produce terminals for foreign two-way systems. "But the question remains," he observed, "will it sell quantities large enough to justify the capital investment?"

The current answer to that question, he contended, is no. "What if we're wrong?" he asked. "Well, it wouldn't take long to gear up one of our manufacturing facilities [to produce compatible terminals]." ■

Revolution now!

Has the electronic information revolution arrived? Newspaper executives at the N.N.A. convention (see main story) went home with varying views.

There is a fundamental difference between a society that possesses a few computers and telephones and a true information society, said Morris Tanenbaum, executive vice president of AT&T.

The dawn of the information age, he contended, will occur when a "critical mass of information services" is reached. Only then, he added, will a consumer understand what the information age is and what he or she has been missing.

Charles A. Phillips, senior vice president for special markets for Radio Shack, rapped computer experts who claim the information revolution is yet to come.

"I believe," he declared, "that when our historical perspective of the years 1981-1982 is refined, you will discover that as we convene here today, the electronic information era is a reality. It is futuristic only for those whose perspective may be blinded by their inability to recognize and adapt to present technology." ■

ATT 2nd CBS in videotext test

Two communications giants will team up in a two-way tv experiment in Ridgewood, NJ.

The videotext try by American Telephone and Telegraph and CBS is scheduled for this fall. It is similar to another AT&T venture with Viewdata Corp. (a subsidiary of Knight-Ridder Newspapers) in Coral Gables, FA. The experiment will involve 200 families who will participate free.

The tv network will provide news and information for the test. Ma Bell will furnish transmission lines and computer systems, including home terminals, adapters for tvs, and specialized data terminals.

The experiment will include banking and shop-at-home services, but not electronic telephone directories. National and local advertisers will not pay for participating in the videotext trial.

The move by the two conglomerates was viewed by one observer as a major turning point in AT&T's efforts to test home information retrieval systems. Ultimately the program could include advertising and shopping programs brought into the home by the Bell System.

Another observer quoted in *Editor & Publisher* claimed one reason AT&T participated in the experiment is it "is scared to death of the growth of two-way cable tv."

The proposed system would bring CBS news and publishing resources into the home via AT&T's telephone network. AT&T is the world's largest company with assets of $125 billion. CBS, with assets of $2 billion, is the nation's 94th-largest industrial corporation and one of its biggest communications concerns.

CBS controls a worldwide news-gathering network through its broadcast holdings, and owns a variety of "consumer" magazines, such as *Woman's Day* and *Mechanix Illustrated*, part of a corporate unit consisting of 60 newstand magazines and six book lines. ■

Big market for electronic news but "bladders" will survive

Electronic information systems will not supplant newspapers, N.N.A. conferees were told at their gathering in Boston.

"Futurists have been saying for some years now how there'll be no printed newspapers in the future," said Morris Tanenbaum, executive vice president of AT&T. "That prospect seems pretty far-fetched to me."

The Bell System estimates that less than 10 percent of the households in the United States will subscribe to electronic information systems by 1990. Tanenbaum called that a "sizable market" but not one so large it would divert newspapers from their current primary line of business.

Charles A. Phillips, senior vice president for special markets for Radio Shack, added:

"No one really believes the electronic edition will replace the printed newspaper, but as people's needs for more information, more specific information and more timely information grow, the electronic newspaper will be the best medium to meet their needs. But after all, there are certain places you just can't bring the keyboard and the tube. . . the bathroom and bed come to mind!" ■

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Nails, snails and tails not for this whiz kid

by Carolyn Nolan
80 Micro Staff

Whoever said boys were made of nails and snails and puppy dog tails could not have had Simon Zuckerbraun in mind.

Simon is 10 years old and writes game programs in Assembly language for his TRS-80 Model I Level II. When he invites his friends over after school, all of them disappear into his basement in the Bronx not to be heard from again for hours.

Such is the story told by Dr. Harriet Zuckerbraun, a research microbiologist who is taking time off from one career to pursue another—mothering Simon and his six-year-old brother. She and Jacob Zuckerbraun, Simon's father, both agree Simon is one surprise after another.

About two years ago, Jacob Zuckerbraun was designing some microprocessors for his work as an electrical engineering consultant. Eight-year-old Simon, asked so many questions his father introduced him to the technical literature he had on hand. Soon they were talking shop. Zuckerbraun said he "often uses Simon as a consultant because his understanding of the inner workings of the computer is so complete and he seems able to visualize what actually goes on inside the computer."

Thus began Simon's computer career. After he mastered Assembly language his father encouraged Simon to study the Level II Basic manual even though Simon could hardly see the reason since he was so comfortable with Assembly language. In the spring *80 Micro* will publish "Scoreball," "Dynamic Birthday Card," and "Cops and Robbers" game programs written by Simon Zuckerbraun. Simon also has created a sketching program and a music compiler. When asked how he felt when he learned his programs had been accepted Simon said, "I danced."

Simon attends P.S. 89 Bronx where he studies the same subjects as most other fifth graders, and plays soccer and baseball on the playground. His mother says he is good in his subjects and participates in the program for gifted and talented children, but they have no computers in the school. Perhaps that is a good thing since it has given Simon time to explore other talents.

His teachers encouraged him to enter a story-telling contest in third grade. He participated two years in a row, placing district runner up the first year and Bronx Borough runner up the second year. To compete, the students had to find an old tale and research traditional story-telling practices. They *tell* their stories, without props or hand motions, relying entirely on their voice and facial expressions for effect. The second year he competed, Simon chose a story called "Obedient Jack" about a boy who got the simplest instructions confused and whose obtuseness caused him and his mother endless troubles.

Simon Zuckerbraun

Simon was commended for his "poise, voice control and sophistication far beyond his years" by Mercedes L. Rowe, the district library media coordinator.

Besides his virtuosity as a story teller and computer programmer Simon also finds time to play the piano. He is learning a *Fantasia* by Mozart and some *Variations* by Dmitri Kabalezsky. No nails and snails for this Simon Zuckerbraun.■

Source users get "super services"

You asked for it and you're going to get it, a McLean, VA, data service has told its 11,500 subscribers.

The Source—a subsidiary of The Reader's Digest Assn. Inc.—has introduced a group of "super services" tailored to what its customers said they wanted in a survey conducted by the firm last spring (See *80 Microcomputing* Dec. 1980).

Among the new services offered by The Source Telecomputing Corp. are:

- Legi-Slate, a service tracking bills in the Congress;
- COMPUSTAR, an electronic discount shopping service featuring instant ordering and keyword search of more than 30,000 items;
- Management Contents, Ltd., a base of concise abstracts of articles from the 27 leading business publications;
- Commodity News Service, information on the commodities market with periodic updates while it is trading; and
- Media General, a service updated weekly providing detailed background on over 3,100 stocks.

The new services, called Source Plus, cost $30 an hour for weekday use; $15 for evening and weekend use. Regular Source services cost $18 an hour weekdays; $5.75 evenings and weekends; and $4.25 after midnight.

One of the latest features on the regular Source is an electronic book ordering service coordinated by the Professional Book Center in Portland, OR. The center has more than 100,000 editions of 600,000 currently published books.

A Source user may pay with a credit card for the book and its $1.95 postage and handling. The center will inform a customer within 24 hours if a book is out of print. Another feature of the service allows a buyer to specify the maximum amount he or she is willing to pay for the book in his or her order. If the book costs more, the center informs the buyer.

At the time the survey results were released, Source Vice President A. Martin Clark observed:

"Now we are seeing a rapid spread of practical interest in the benefits of electronic, computer-based services among business professionals."

An indication of that, he noted, is the study conducted by Staples Information Inc. of Houston, TX. It showed only 27 percent of the service's subscribers belong to computer clubs. A year ago, he added, 44 percent of the subscribers said they belonged to clubs.■

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PULSE TRAIN

Booming Micro sales

The Venture Development Corp., a Wellesley, MA, research firm says to expect booming small computer sales through 1984. The company predicts shipments of computers priced under $20,000 will increase by 33.5 percent annually through 1984. A copy of the report—"The Small-Business Computer Industry: A Strategic Analysis"—is available from VDC for $19.50.

New Cobol Proposed

The American National Standards Committee of Washington, DC has proposed a new standard Cobol. According to a panel statement, the draft regulations clean up existing specifications to improve the definition and use of the language and add new capabilities to it, including structured program constructs, nested programs and reference modification. A copy of the draft standards may be obtained for $25 from X3 Secretariat, CBEMA, 1828 L St NW, Suite 1200, Washington, DC 20036, Attn: dpANS X3.23-198X. The deadline for filing comments on the proposed changes is Feb. 13.

Packet For Tandy

A coast-to-coast computerized ordering system has been established for Radio Shack stores in Canada using Datapac, a Canadian national packet switching network. The system replaces mailing completed order forms to Tandy Electronics Limited headquarters in Barrie, Ontario, according to a statement from The Computer Communications Group. Reliability was a key in choosing the system. Jerry Colella, vice-president and managing director of Radio Shack-Canada said, "There was *no* reliability in the Canadian mail system," and added, "it was so undependable that a letter or order could take from five days to 21 days to be delivered. We needed a safeguard and this sophisticated computer communications system was invaluable during the postal strike."

WordStar Hardware

Creators of the highly touted word processing program WordStar are getting into the hardware business. MicroPro International Corp. has formed a new division, Performance Business Machines, to develop, manufacture and market microcomputer systems for commercial applications. MicroPro President Seymour Rubinstein said in a statement: "We perceived a need among small as well as medium and large-sized businesses for a microcomputer that could do more than machines intended for personal computing or hobbyists, but priced below the business system offerings of most major computer companies." The suggested retail price of PBM's microcomputer is $6995.

Tecstor Distributor

CMP Network will market Tecstor's 14-inch Winchester disk drives in six eastern states. The California firm's Sapphire 160—to be sold by CMP in Michigan, Indiana, Kentucky, Ohio, West Virginia and west Pennsylvania—has a storage capacity of 168 megabytes and can replace the Control Data 9730, DEC RM80 and others.

Digital and Wang into Micros

Two more Fortune 500 firms have entered the scramble started by IBM and Xerox to carve up the microcomputer market. The Digital Equipment Corporation's entry is a $5,000 system using the company's VT100 video display terminal equipped with a single printed board containing a Zilog Z80A chip, 64K of internal memory and 160K of external storage in two disk drives. Wang Laboratories has modified its Wangwriter. Both micros use the CP/M operating system. The move by Wang was seen by one marketing expert as an important precursor of the changing micro market. George Colony of the Yankee Group, a research firm in Cambridge, MA, commented in *InfoWorld*: "The personal desk-top-computer market is going to be fought out by IBM, Xerox and Wang. Manufacturers will have to distribute 50,000 systems per month to be in that business. In two or three years, Commodore and Apple will really look too small to play the game."

Not for the Hobbyist

Byte heads who are news satyrs must be less than sated with the announcement by the New York Times Information Service that the full text of its namesake will be computerized. The new service—called The New York Times On Line— offers all the material in the conventional *Times* from June 1, 1980. According to Michael Israel, vice president of marketing for the information service, subscribers pay $40 to $150 an hour for NYT on line. An abridged version of the *Times* is offered on the CompuServe information system for $5 an hour. Israel observed, "We're watching developments in the whole market very closely but at the present time we're not convinced there is a market for this thing in the home."

Apple, IBM Head-to-head

Apple has announced a marketing plan for its computers, placing its dealers in head-to-head competition for corporate clients with IBM's direct sales force and other competitors. The plan establishes a uniform volume discount to compete with one offered on IBM's personal computer. Xerox and IBM sell to corporate clients through their direct sales networks. Apple sells its computers through independent retailers. Apple's largest retailer, ComputerLand, has announced its own plan to market IBM and Apple computers to corporate accounts.■

Green Thumb farm info project takes root in state of Kentucky

by Eric Maloney
Kilobaud Staff

Green Thumb, the University of Kentucky Cooperative Extension Service's pioneering agricultural videotext service is now a permanent resource to Kentucky farmers.

Started in March of 1980, the project offers a variety of databases, including weather and market information. A TRS-80 Model II serves as home computer and can be accessed by anyone with a videotext terminal, or TRS-80, Apple or TI 99/4 microcomputer and a coupler.

Green Thumb was launched in conjunction with the U.S. Department of Agriculture and the National Weather Service to determine the hardware specifications and logistics of such a service. Some 200 farmers in Shelby and Todd counties used numeric keypads developed by Tandy to retrieve the data. The host computer was an HP-3000 mainframe. It sent data to Western Union GS-200 store-and-forward computers in each county.

Of the 200 initial users, some one-third will stay with the system, said Dr. John Ragland, the Extension Service's assistant to the director. He projects that the system should have about 200 users by July of 1982, with perhaps two or three times that number by mid-1983. Except for hardware and telephone costs, the service is free.

The database has 17 categories. These include weather, commodity prices from the Chicago Board of Trade, county news, and information on pest management, home economics, resource development, agriculture economics, agriculture engineering, animal sciences, entomology, forestry, horticulture, plant sciences, and veterinary medicine. About 90 percent of the market information and 60 percent of the weather data is updated automatically, while the other categories are updated from once a week to once a month.

Extension Service data shows that market information and weather are the overwhelming favorites, accounting for 50.2 percent and 31.9 percent of the calls respectively. After that comes county news (3.9 percent) and agricultural economics (3.8 percent).

Use of the system declined sharply during its first 10 months. The average number of daily calls dropped from 85 to 19 in Shelby County and 120 to 34 in Todd County. The decline, said Ragland, was due partly to the novelty of the system wearing off and to problems updating the database.

"We're going to place a great deal more emphasis on trying to keep the data current," he said.

The University of Kentucky funded the project. Ragland thinks that such financial support is important to keep the farmer's costs to a minimum.

"Farmers have traditionally had technology and information provided in fairly good quality and quantity for low cost, through extension agencies and the government," he said. "It's a fact that leads me to believe that we should look at alternative means of providing the information without charging the farmer a user's fee."

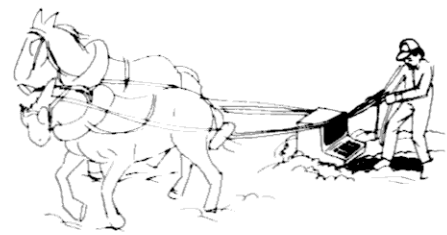
Where there's heavy electronic traffic, GT may use s-and-f units.

Eventually, Ragland said, store-and-forward units can be placed in parts of the state where the electronic traffic is particularly heavy. This will reduce the farmer's costs further by eliminating long-distance calls to the host computer.

While Green Thumb works through the Kentucky Cooperative Extension Service, several other videotext services have chosen the commercial route. Instant Update in Cedar Falls, IA, offers similar information to its subscribers, while Agrivision reaches some 2000 customers of Elanco.

Instant Update, which is marketed by the Professional Farmers of America, and Agrivision are similar. In fact, Pro Farmers provides the editorial material for Agrivision. Both are modeled after Project Green Thumb, and use modified Radio Shack Videotex terminals.

Instant Update has about 600 subscribers, "which is what we consider to be pretty good even though it's not what we hoped for," said Pro Farmers' Stewart Cross. The service emphasizes market information for farmers in the Midwest.



Until recently, Instant Update was available only to farmers with the Instant Update videotext terminal. But Cross says that software is now available for the Apple, and will soon be marketed for the TRS-80s.

Subscribers pay $95 a month for the service, along with telephone charges. Average monthly costs come to about $125, said Cross.

Agrivision is a premium available to farmers who buy 250 gallons of Elanco's herbicide treflan, at $25 a gallon. The database is geared toward cotton and soy bean farmers in the South.

The service bolsters Elanco's image as a "leader in innovation," said Manager of Managerial Servicing Roger Benson. "Hopefully, we would gain a certain amount of market loyalty."

But, he adds, "The farmer has a tremendous need for up-to-date information that has already been scanned for him."

Elanco does not advertise on the system; Benson called it "inappropriate." He said, however, the company has the option of adding an access code for information on Elanco products.

How big is the market for agricultural videotext systems? The USDA says that the country has some 2.4 million farms. A recent survey by *Successful Farming* magazine showed that about 25 percent of its readers were interested or very interested in videotext. This figure represents some 600,000 farms, more than enough to support commercial endeavors.

"But videotext is limited by how good the information is," Benson summed up. "As long as it's expensive to access the information, it has to be worth the customer's while." ■

80 APPLICATIONS

by Dennis Kitsz

". . . here's your chance—fill out the second annual readers' survey. . ."

Schizophrenia is taking over. Ever since I hinted six months ago that I might phase Model I support from this column, hundreds of owners have threatened to strangle me with buffered cables and administer unusual acupuncture treatments with 16-pin memory chips. On the other hand, Color Computer users have been silent (are you there?). So here's your chance—fill out the second annual readers' survey at the end of this column or send a postcard equivalent (no letters please). In the meantime, I will maintain that split personality.

This month: an almost-hardwareless speaking voice for the Model I, and a standard keyboard for the Color Computer. As talking devices (Micromouth, VoxBox, and others) become more commonplace for personal computers, a software method might be possible even with the limited input/output structure of the Model I. For the Color Computer it should be easy (more on that in the future), but the Model I has no true audio input or output. The cassette port is its only access, and intelligible speaking voices will sound from there.

The Color Computer was instantly maligned for its two most obvious flaws— its lack of true lowercase and its peculiar, toy-like keyboard. We solved the former problem with the CoCo Lowercase project (November); this month we tackle the keyboard, replace it with a Model I keyboard and retire those square buttons.

Dr. Watson, Come Here

The genesis of an idea often takes time, but seems so obvious once it materializes. So it was with synthesizing voice on the Model I. Software-only voice output has appeared occasionally over the past year, but with vocabularies limited to the words provided in the programs. On the other hand, hardware devices (even at $100 or so) were costly for something merely experimental. There had to be a software solution.

And indeed there is and a tiny hardware modification will increase intelligibility enormously. A 48K TRS-80 can produce about 30 seconds of adequate speech, more than enough for games, important program prompting, and so on. Even a 16K system can squeeze in ten numbers and a few other words.

Effective voice synthesis on the Model I depends on: the quality of the cassette input circuitry, the clarity and frequency spectrum of your voice, the output speaker, and how long it takes the listener to get used to the results. The cassette input circuitry on the Model I has taken some criticism, and will not work well without modification. Vocal clarity is a result of diction and the microphone used. Ironically, the best results are obtained with a *cheaper* microphone and with a smaller, tinnier-sounding speaker than those in the CTR-41 tape recorder.

Fig. 1 shows waveforms—written analogies to the path sound patterns travel through air molecules. The top waveform is a small section of an ordinary vocal sound; it is a complex pattern of frequency and intensity elements. The second waveform is purely digital, derived through a very crude technique: Any part of the original sound waveform above the dotted centerline converts to a binary one, and any part below the centerline becomes a binary zero. You can sample the result by a machine language program at regular intervals, and store it in memory as a string of bits. Finally, the third waveform shows how that string of bits stored in memory might be output through a low-quality speaker, one unable to follow the demandingly fast transitions from one to zero of purely digital waves. The low-quality audio output "slurs" the waveform, actually restoring some of the quality lost when it was digitized.

The human ear and the brain can discover coherent results even in very distorted sounds. Consider how most people can understand a single voice out of the furious electronic racket emanating from a CB radio, or how spectators can discern an announcer's message amongst the echoes on a football field or the clamor in an airline terminal. The sound produced by the Model I will resemble that of a CB radio.

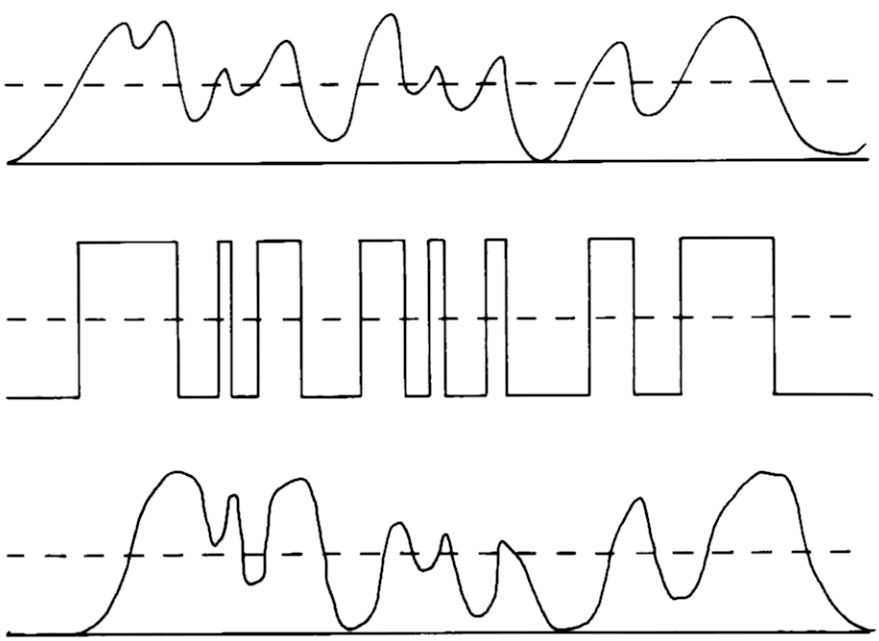


Fig. 1. Idealized waveforms of speech input to the computer (top), digitized results being sent to memory (middle), and output reproduced by a cheap amplifier/speaker (bottom).

Program Listing 1. Full assembly listing of a speech input/output program for the Model I.

```
                00100 ; ************************************************
                00110 ; QUICK TEST PROGRAM FOR VOICE INPUT/OUTPUT USING THE MOD
                00120 ; I CASSETTE PORT.  USABLE WITH LEVEL II OR DISK SYSTEMS.
                00130 ; CHANGE LINES MARKED (*) FOR USE WITH DISK BASIC.
                00140 ; ************************************************
                00150 ;
4300            00160           ORG     4300H           ; LOW POINT IN MEMORY (*)
06CC            00170 MONITR    EQU     06CCH           ; BASIC (CAN BE MONITOR)
4300 F3         00180 START     DI                      ; USE IT WITHOUT BOTHER
4301 CDC901     00190           CALL    01C9H           ; CLEAR THE SCREEN
4304 3A3D40     00200           LD      A,(403DH)       ; START BY RESETTING PORT
4307 D3FF       00210           OUT     (0FFH),A        ; TO CLEAR INCOMING BITS
                00220 ;
                00230 ; ************************************************
                00240 ; KEYBOARD ROUTINE FOR ENTER (INPUT), CLEAR (OUTPUT), OR
                00250 ; UP-ARROW (BASIC).  CAN USE UP-ARROW FOR EXIT TO MONITOR
                00260 ; ************************************************
                00270 ;
4309 3A4038     00280 KEYTST    LD      A,(3840H)       ; GET ENTER/CLEAR ROW
430C FE01       00290           CP      1               ; CHECK IF ENTER PRESSED
430E 2808       00300           JR      Z,INPUT         ; GO TO INPUT ROUTINE
4310 FE02       00310           CP      2               ; CHECK IF CLEAR PRESSED
4312 285D       00320           JR      Z,OUTPUT        ; GO TO OUTPUT ROUTINE
4314 FE08       00330           CP      8               ; CHECK IF IT'S UP-ARROW
4316 CACC06     00340           JP      Z,MONITR        ; OUT TO BASIC OR MONITOR
4319 18EE       00350           JR      KEYTST          ; BACK FOR ONE OR T'OTHER
                00360 ;
                00370 ; ************************************************
                00380 ; INPUT FROM PORT FF (255 DECIMAL) AND STORAGE IN MEMORY
                00390 ; ************************************************
                00400 ;
431B 21A343     00410 INPUT     LD      HL,MSG01        ; GET THE "INPUT" MESSAGE
431E CDA728     00420           CALL    28A7H           ; AND DISPLAY ON SCREEN
4321 3A3D40     00430           LD      A,(403DH)       ; GET VALUE FOR PORT MASK
4324 4F         00440           LD      C,A             ; SAVE MASK IN C REGISTER
4325 210044     00450           LD      HL,4400H        ; BEGIN VOICE STORAGE (*)
4328 1608       00460 LOOP1A    LD      D,8             ; NUMBER OF BITS IN BYTE
432A DBFF       00470 LOOP2     IN      A,(0FFH)        ; GET VALUE AT THE PORT
432C CB17       00480           RL      A               ; STASH IT IN CARRY BIT
432E CB13       00490           RL      E               ; BUMP IT INTO E REGISTER
4330 79         00500           LD      A,C             ; GET VALUE OF PORT MASK
4331 3A4038     00510           LD      A,(3840H)       ; CHECK ENTER/CLEAR ROW
4334 FE80       00520           CP      80H             ; CHECK IF SPACE PRESSED
4336 C25343     00530           JP      NZ,ESCAPE       ; OUT IF KEYBOARD CLEAR
                00540 ;
                00550 ; >>>> NOTE! DELAY VALUE BELOW IN THE B REGISTER    <<<<
                00560 ; >>>> MAY BE INCREASED.  INTELLIGIBILITY WILL BE   <<<<
                00570 ; >>>> LESSENED BUT MEMORY WILL BE CONSERVED.  FOR  <<<<
                00580 ; >>>> EACH INCREASE IN THIS VALUE, ALSO INCREASE   <<<<
                00590 ; >>>> THE VALUE BY THE SAME AMOUNT IN PLAYBACK.    <<<<
                00600 ;
4339 0604       00610           LD      B,4             ; GET SHORT DELAY VALUE
433B 10FE       00620 DELAY1    DJNZ    DELAY1          ; AND DELAY A WHILE
433D D3FF       00630           OUT     (0FFH),A        ; MUST RESET PORT INPUT
433F 15         00640           DEC     D               ; DECREMENT TOTAL BITS
4340 C22A43     00650           JP      NZ,LOOP2        ; CONTINUE IF MORE TO DO
4343 73         00660           LD      (HL),E          ; SAVE FULL BYTE IN MEM.
4344 23         00670           INC     HL              ; GO ON TO NEXT BYTE
4345 7C         00680           LD      A,H             ; GET VALUE OF M.S. BYTE
4346 FE00       00690           CP      00H             ; USE FOR 48K MACHINE
                00700 ;         CP      0C8H            ; USE FOR 32K MACHINE
                00710 ;         CP      080H            ; USE FOR 16K MACHINE
4348 C22843     00720           JP      NZ,LOOP1A       ; IF NOT DONE THEN MORE
434B 21B443     00730           LD      HL,MSG02        ; GET "INPUT COMPLETE"
434E CDA728     00740           CALL    28A7H           ; AND DISPLAY THE MESSAGE
4351 18B6       00750           JR      KEYTST          ; DONE - BACK TO KEY TEST
                00760 ;
                00770 ; ************************************************
                00780 ; PAUSE CHECK DURING ENTRY; SPACEBAR = GO, OTHERWISE STOP
                00790 ; ************************************************
                00800 ;
4353 E5         00810 ESCAPE    PUSH    HL              ; SAVE CURRENT POINTER
4354 CDAF0F     00820           CALL    0FAFH           ; DISPLAY CURRENT MEM.
4357 21EA43     00830           LD      HL,MSG05        ; GET "WORD START" MESS.
435A CDA728     00840           CALL    28A7H           ; AND DISPLAY THE MESSAGE
435D E1         00850           POP     HL              ; RESTORE MEMORY PTR.
435E 3A4038     00860 RECHEK    LD      A,(3840H)       ; ENTER/CLEAR KEYBRD ROW
4361 FE80       00870           CP      80H             ; CHECK IF SPACE AGAIN
4363 28C3       00880           JR      Z,LOOP1A        ; BACK TO MAIN LOOP
4365 FE04       00890           CP      4               ; CHECK IF BREAK KEY
4367 20F5       00900           JR      NZ,RECHEK       ; KEEP LOOKING ENT OR BRK
4369 21B443     00910           LD      HL,MSG02        ; GET "INPUT COMPLETE"
436C CDA728     00920           CALL    28A7H           ; AND DISPLAY THE MESSAGE
436F 1898       00930           JR      KEYTST          ; AND BACK TO KEY MENU
                00940 ;
                00950 ; ************************************************
                00960 ; OUTPUT FROM MEMORY OF RECORDED VOICE TO CASSETTE PORT
                00970 ; ************************************************
                00980 ;
4371 21C543     00990 OUTPUT    LD      HL,MSG03        ; GET "BEGIN OUTPUT"
4374 CDA728     01000           CALL    28A7H           ; AND DISPLAY THE MESSAGE
4377 3A3D40     01010           LD      A,(403DH)       ; PORT FF OUTPUT MASK
437A 4F         01020           LD      C,A             ; SAVE OUTPUT MASK IN C
437B 210044     01030           LD      HL,4400H        ; START VOICE STORAGE (*)
437E 1608       01040 LOOP3A    LD      D,8             ; NUMBER OF BITS IN BYTE
4380 7E         01050           LD      A,(HL)          ; GET VALUE FROM MEMORY
4381 5F         01060           LD      E,A             ; SAVE IT IN E REGISTER
4382 AF         01070           XOR     A               ; CLEAR ACCUMULATOR TO 0
4383 CB13       01080 LOOP4     RL      E               ; SEND BIT TO CARRY FLAG
4385 CB17       01090           RL      A               ; AND ROTATE 'ROUND TO A
```

Program Listing 1 continues

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Program Listing 1 continued

```
4387 B1       01100          OR      C               ; USE THE PORT FF MASK
4388 D3FF     01110          OUT     (0FFH),A        ; AND SEND OUT THE VALUE
              01120 ;
              01130 ; >>>> NOTE! BELOW IS THE PLAYBACK VALUE WHICH MUST <<<<
              01140 ; >>>> BE CHANGED IF SAMPLING DELAY IN THE INPUT    <<<<
              01150 ; >>>> AREA IS ALTERED.  THIS VALUE IS ALWAYS TWO   <<<<
              01160 ; >>>> GREATER THAN THAT IN THE INPUT SAMPLING AREA <<<<
              01170 ;
438A 0606     01180          LD      B,6             ; GET SHORT DELAY VALUE
438C 10FE     01190 DELAY    DJNZ    DELAY           ; AND DELAY SHORT WHILE
438E AF       01200          XOR     A               ; CLEAR ACCUM. BACK TO 0
438F 15       01210          DEC     D               ; BITS = BITS MINUS ONE
4390 C28343   01220          JP      NZ,LOOP4        ; AND BACK FOR SOME MORE
4393 23       01230          INC     HL              ; GET NEXT BYTE FROM MEM.
4394 7C       01240          LD      A,H             ; GET VALUE OF M.S. BYTE
4395 FE00     01250          CP      00H             ; FOR 48K MACHINE
              01260 ;        CP      0C0H            ; FOR 32K MACHINE
              01270 ;        CP      080H            ; FOR 16K MACHINE
4397 C27E43   01280          JP      NZ,LOOP3A       ; AND GO BACK FOR MORE
439A 21D643   01290          LD      HL,MSG04        ; GET "OUTPUT COMPLETE"
439D CDA728   01300          CALL    28A7H           ; AND DISPLAY THE MESSAGE
43A0 C30943   01310          JP      KEYTST          ; AND BACK WHEN DONE
              01320 ;
43A3 42       01330 MSG01    DEFM    'BEGIN SPEAKING.'
43B2 0D       01340          DEFB    0DH
43B3 00       01350          DEFB    00H
43B4 49       01360 MSG02    DEFM    'INPUT COMPLETE.'
43C3 0D       01370          DEFB    0DH
43C4 00       01380          DEFB    00H
43C5 42       01390 MSG03    DEFM    'BEGIN PLAYBACK.'
43D4 0D       01400          DEFB    0DH
43D5 00       01410          DEFB    00H
43D6 50       01420 MSG04    DEFM    'PLAYBACK COMPLETE.'
43E8 0D       01430          DEFB    0DH
43E9 00       01440          DEFB    00H
43EA 20       01450 MSG05    DEFM    ' = WORD START POINT.'
43FE 0D       01460          DEFB    0DH
43FF 00       01470          DEFB    00H
              01480 ;
              01490 ; *****************************************************
4300          01500          END     START
00000 TOTAL ERRORS


DELAY  438C 01190   01190
DELAY1 433B 00620   00620
ESCAPE 4353 00810   00530
INPUT  431B 00410   00300
KEYTST 4309 00280   00350 00750 00930 01310
LOOP1A 4328 00460   00720 00880
LOOP2  432A 00470   00650
LOOP3A 437E 01040   01280
LOOP4  4383 01080   01220
MONITR 06CC 00170   00340
MSG01  43A3 01330   00410
MSG02  43B4 01360   00730 00910
MSG03  43C5 01390   00990
MSG04  43D6 01420   01290
MSG05  43EA 01450   00830
OUTPUT 4371 00990   00320
RECHEK 435E 00860   00900
START  4300 00180   01500
```

Getting Started

Listing 1 is a simple voice input/output module for the speech storage system. If you tap the Enter key, the computer will allow voice input; the Clear key will begin voice output. Holding down the space bar during voice input will store the speech data into memory; lifting it stops storage. The Space bar will display the decimal value of memory where each section of speech is stored. Hitting Break will return to main keyboard input. After voice input, pressing Clear plays back the entire contents of memory. Assemble a version for your computer's memory configuration, as indicated in the assembly listing.

Connect a CTR-41 or similar tape recorder to the TRS-80, and remove the dummy microphone plug. Insert a blank cassette and place the tape machine into record mode; wait for the record electronics to stabilize (about five seconds), tap Enter, hold down the space bar, and begin to speak. The program will display a "memory filled" message when there is no space left—from five to twenty seconds, depending on the computer's available memory. Leave the tape recorder in record mode, but reinsert the dummy microphone plug. Tap Clear. Memory will be dumped to tape, and the computer will prompt you with an "output complete" message. Rewind the tape and listen to both sections of tape.

The first section is your voice as taped, and the second section is the computer's result. Chances are the results will vary from total gibberish to something resembling (at least in its inflection) the input speech.

Various adjustments may improve the results. First, instead of using the built-in microphone, obtain a cheap crystal microphone module (see parts list). The frequency response of crystal microphones is poor on the low end, which filters out extraneous rumbling and booming noises. It also has a peak in the middle-high male voice range, or middle female voice range which makes a crystal mike ideal for emphasizing just the speech components of the frequency spectrum.

Try the above experiment, inserting the crystal microphone when the dummy plug is removed. Speak closely and clearly. The results may improve a little. To make it sound better, actually record a tape and play it into the computer as you would with a data tape; this will allow you to adjust the level for best results.

But what if the results are always terrible? Okay, it's time for some hardware—just a little hardware, though, so you software folks shouldn't get too nervous (you mean the Model I hasn't been manufactured for a year and you *still* haven't opened the case?).

There are two related reasons why the sound input may be extremely poor. First, if you have an unmodified keyboard unit, the cassette input circuitry needs some help, which is easy. The second is Radio Shack's own fix—its infamous XRX-2 cassette modification, standard in later units. This is a 500-baud-only device; if you've ever tried to convert Level I tapes or use a high-speed software loader, you know the frustrations caused by this fix. The XRX board opens a "window" only 500 times per second making high-speed speech input impossible.

To modify the keyboard unit for speech input is easy, though; it requires very little soldering, and is completely removable in five minutes if at some time you want Radio Shack service for your computer. A tiny circuit board is available (see parts list).

Parts of Speech

The modification will be presented separately for those with or without the XRX-2 mod. How do you know if you have the modification? A small, inch-square board will be fastened to the bottom of the main circuit board (see Photo 1). It has six wires (red, yellow, blue, grey, purple, green) attached to various places on the main unit. Don't confuse this small board with the Level II Basic board (if you have it), which is connected by a broad, 24-wire cable to a socket.

If you do not have the XRX modification, things will be a bit simpler. You will need an integrated circuit comparator (type LM339N), six resistors (two 1,000 ohms; two 5,600 ohms; one 1,500 ohms; and one 1.5 megohms), a small silicon diode (1N4148 type), and a single-pole, single-throw switch. Table 1 is a parts list; it's less than $6 worth of parts. Some perforated board and "flea" clips will also

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help make assembly easy unless you opt for the printed circuit board.

Fig. 3 is a parts layout of this module. The wire leads from each part are slipped through holes in the perf-board, bent over, and soldered to other parts. The excess leads are clipped short. Flea clips are pushed through the holes (shown as larger holes in Fig. 3), and soldered to nearby wires. The completed assembly is about an inch square. Four colored wires are soldered to the flea clips.

The TRS-80 must be opened *carefully*. Place the unit face down on a soft surface (like a towel), and remove the screws in the bottom with a Phillips screwdriver. Hold the computer together, and flip it over. Lift off the grey cover to expose the keyboard and circuit board. At the back right, the cassette, video and power jacks are visible. Follow with your finger down from the video (center) jack. In line with the video jack is the back of a column of integrated circuits. Glance underneath the board, and locate the first integrated circuit (14-pin black rectangle) below the video jack. This is Z4. Below it, in line, is Z24. Referring to Fig. 4, take a sharp blade and cut the circuit trace leading from Z4 pin 9 to Z24 pin 9. Now follow the rest of Fig. 4 to complete the five connections to the TRS-80 circuit board.

The fifth connection is to the cassette

Quantity	Part	R.S. Part #	Price
1	LM339N Comparator	276-1712	1.49 each
2	1,000-ohm resistor	271-1321	.39 for 5
1	1,500-ohm resistor use 1,800 ohms	271-1324	.39 for 5
2	5,600-ohm resistor use 4,700 ohms	271-1330	.39 for 5
1	1.5 megohm resistor use 1.0 megohm	271-1356	.39 for 5
1	1N4148 silicon diode	276-1122	.99 for 10
1	submini SPDT switch	275-613	1.79 each
	A printed circuit board, or a complete kit of parts, is available from MSB Electronics, Drawer 766, Barre, Vermont 05641. Price of the board alone is $5; the complete kit of parts is $10. If you wish to do the entire construction yourself, for ease of construction you will need:		
1	piece perf-board 3 x 6 (only 1 x 1 piece needed)	276-1395	1.39 each
1	package flea clips (only four clips needed)	270-1392	2.19 for 100
	If XRX-2 modification is in place, add:		
1	submini SPDT switch	275-614	2.19 each
	For crystal microphone assembly, use:		
1	crystal mike element	270-095	1.59 each
1	mini plug cable	42-2434	2.29 each

Table 1. Parts list and sources of parts for Model I cassette modification for speech input.

Quantity	Item	Source	Part Number	Price
1	Keyboard	Radio Shack	373-70100A, as is	$25-30
	Keyboard	Radio Shack	1700070, recond.	$75
	Keyboard	Jameco Elec.	K62, new	$35
1	Header	Digi-Key	929835-08 or	$2.18
			929835-09	$2.53

Table 2. Parts list and sources for keyboard changeover for Color Computer.

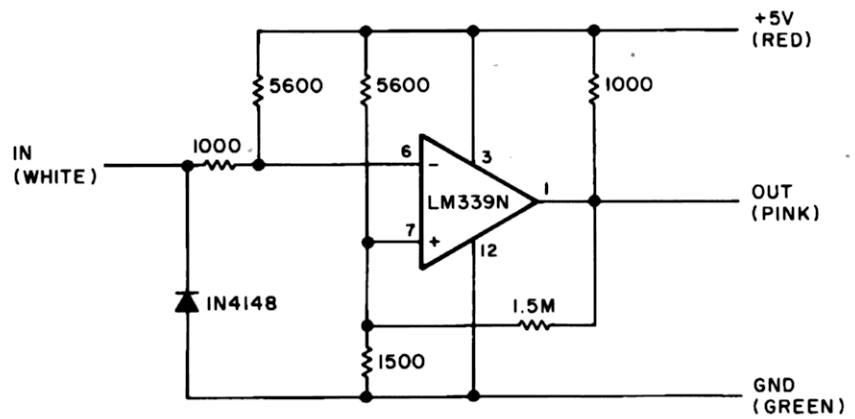

Fig. 2. Full schematic for the Model I cassette modification for speech input. It should be switched out when cassette programs are being loaded (see Fig. 4).

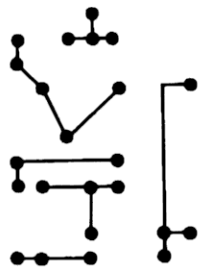

Fig. 3a.

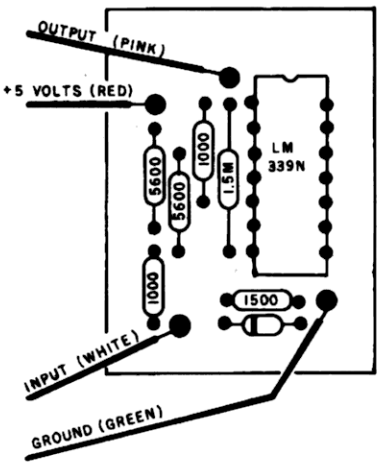

Fig. 3b.

input jack. Notice in the figure that a resistor is shown, "100 to 220 ohms." If you don't find one there, get one and add it as indicated.

In one position, the switch will be your normal cassette input; in the other position, it connects the speech input module (which might improve cassette loading anyway; try it). Turn the computer back on, and try Listing 1 again. Intelligible speech should finally be output by the computer.

Another switch is needed to turn off the XRX cassette modification. Obtain a double-pole, double-throw switch. Examine the small XRX piggyback board, and locate the violet and green wires; cut them roughly in the center.

Cut, strip, and solder wires to the back of the DPDT switch as shown in Fig. 5. Attach the far end of these wires to the cut wires from the XRX board and the main TRS-80 circuit board. Again, refer to Fig. 5.

Tape (or use heat-shrink wire) to insulate the solder connections. In one position the XRX mod is in place, in the other it is switched out.

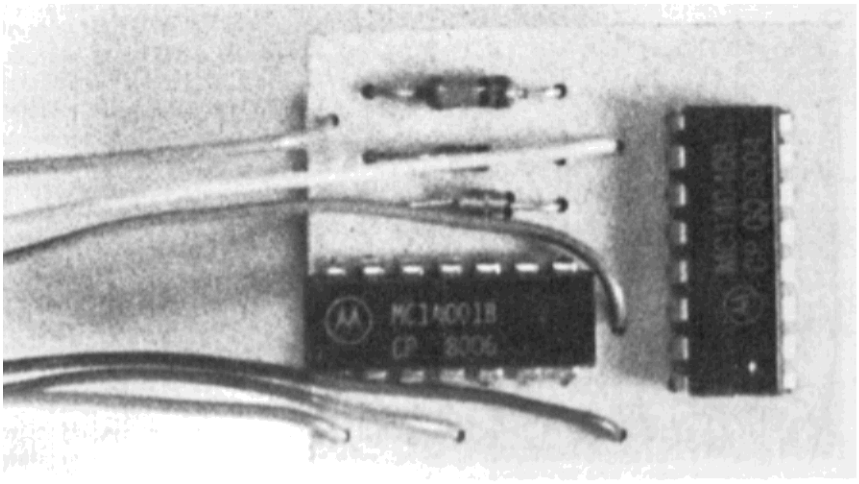

Photo 1. The Radio Shack XRX-2 modification is a 1-inch-square board containing six wires, attached to the main computer board with double-face tape.

Keeping the Speech

Listing 1 is set up as a demonstration module, but it can be used to create speech blocks for use with Basic programs. First, practice with the software as shown. Press the space bar exactly as you start speaking and lift it precisely as your mouth finishes the sound. You don't want to waste memory on silences, since the sampling routine gallops through over 1,000 bytes per second.

The starting memory address is displayed each time the space bar is pressed (sometimes more than once if your space bar suffers from keybounce). This will permit you to load a machine language monitor and recover the blocks of stored voice. For example, if the memory locations are 17408, 19445, and 24762, it means that the first sound runs from

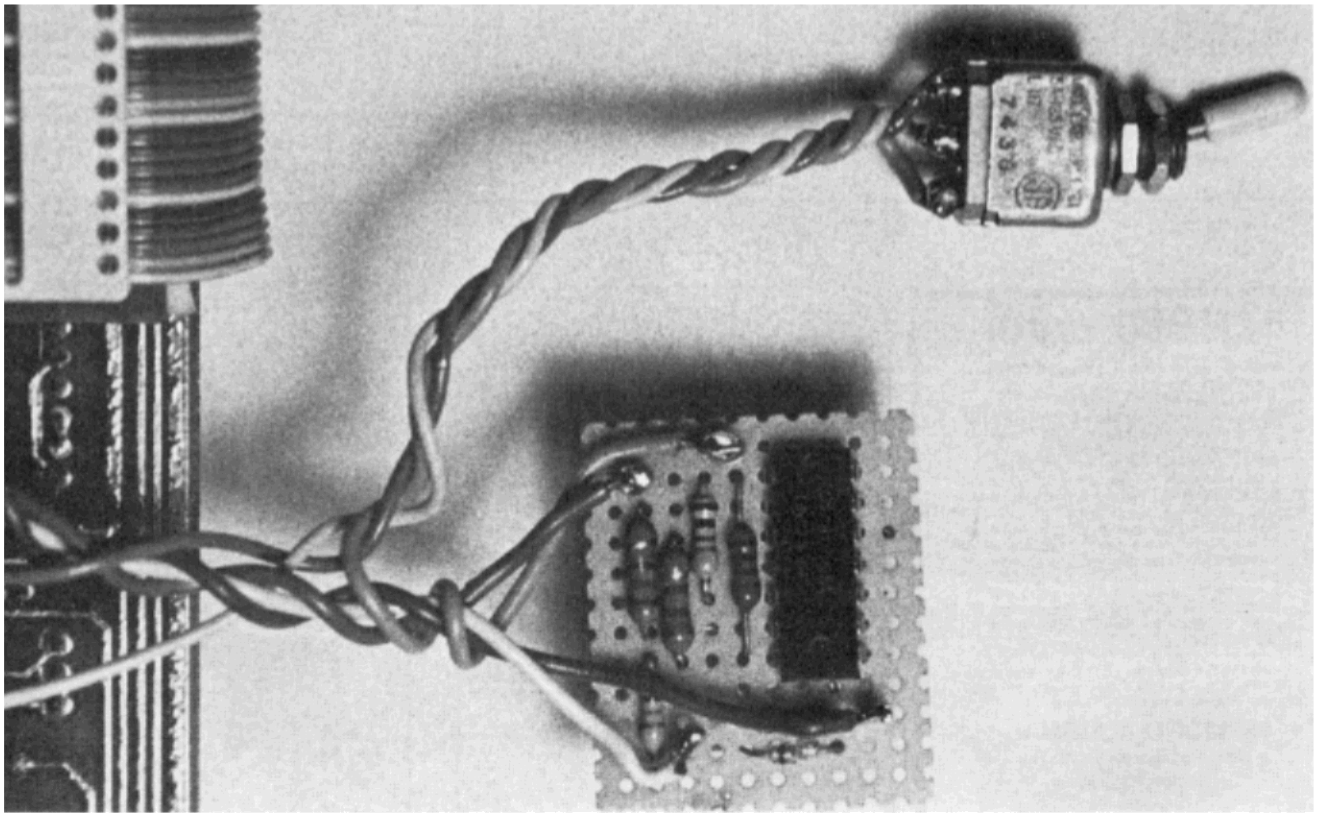

Photo 2. Cassette input board for speech input is assembled on a 1-inch-square piece of perforated board.

17408 to 19444, the second sound runs from 19445 to 24761, and the last sound begins at 24762 (press the space bar again to find where it ends).

These memory sound transfers can be saved to tape or disk, and recalled later. Listing 2 is an extraction of Listing 1, with a few minor changes. In conjunction with the Basic program (such as that in Listing 3) it sounds the words. The starting and ending addresses are placed in Data statements, and accessed by a USR routine. Listing 3 is only a sample program, and the data values shown will produce garbage unless you have input actual voice information.

Disk users can relocate the program, and dump speech blocks to disk, recalling them when they are needed.

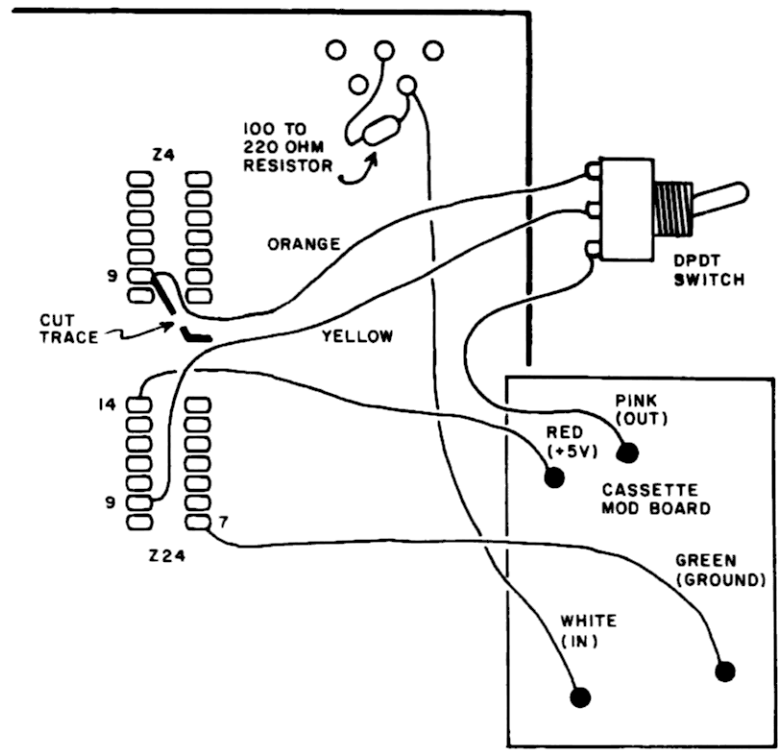

Fig. 4. Board and switch wiring for insertion of the cassette input modification in a Model I with the original cassette circuitry (see text).

Why It Works

As mentioned earlier, the sound is sampled (checked for a "one" level or a "zero" level) and stored in memory as a "bit stream." If a sound is sampled very often—say 50,000 or more times per second—a reasonable picture of its real-world character can be created in digital form. Since the human hearing range runs from 20 to 20,000 transitions per second, every sound level (one or zero) would be picked up at least twice. But there is a strong disadvantage to sampling an input sound this often: Sampling sound 50,000 times per second means that 50,000 bits (more than 6K bytes) of memory would be needed for its storage. Seven seconds of sound would fill the memory of a 48K TRS-80. If you want to compare the results, you can rewrite Listing 1 to achieve close to that rate by eliminating

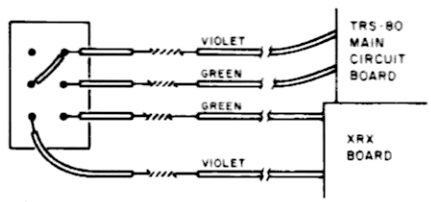

Fig. 5. Board and switch wiring for insertion of the cassette input modification in a Model I with the Radio Shack XRX-2 board already installed (see text).

TRS80 color

From the January 1981 issue of the CSRA Computer Club newsletter:

There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

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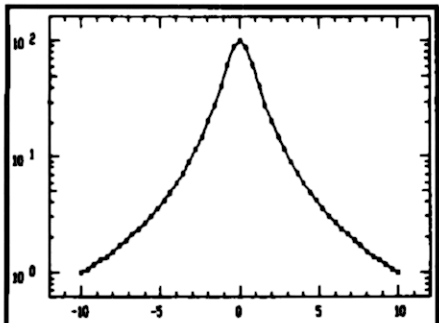

This graph was produced with less than two dozen keystrokes on a TRS-80 Model I with EPSON MX-80 printer plus GRAFTRAX.

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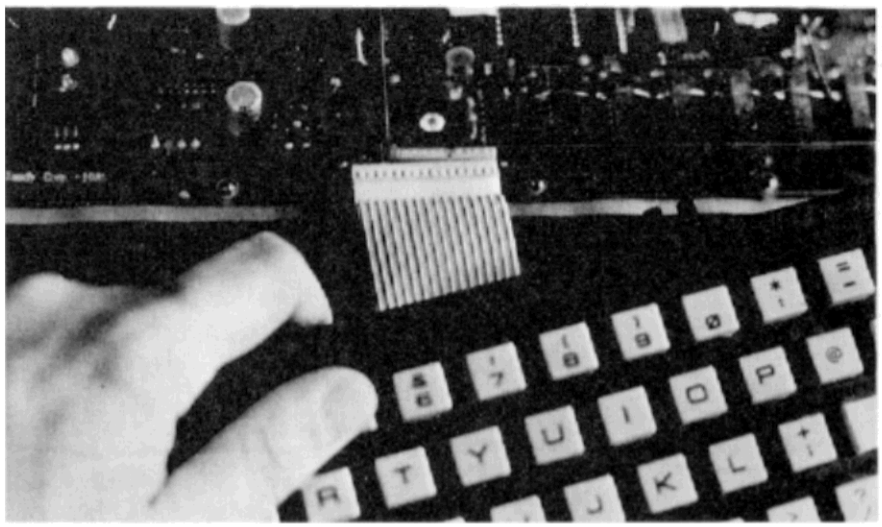

Photo 3. Lifting out the Color Computer keyboard.

```
                00100 ; ********************************************************
                00110 ; USR-CALLABLE ROUTINE FOR USE WITH BASIC PROGRAMS TO
                00120 ; PROVIDE SPEECH OUTPUT.  TWO VALUES TRANSFERRED TO HL.
                00130 ; ********************************************************
                00140 ;
5000            00150           ORG     5000H           ; SOMEWHERE IN MEMORY
                00160 ; >>>> POKE 16526,0 : POKE 16527,80 : A = USR(START)
5000 F3         00170 START1    DI                      ; USE IT WITHOUT BOTHER
5001 CD7F0A     00180           CALL    0A7FH           ; TRANSFER START TO HL
5004 22FE4F     00190           LD      (4FFEH),HL      ; PLACE INTO MEMORY
5007 C9         00200           RET                     ; BACK FOR NEXT VARIABLE
                00210 ; >>>> POKE 16526,8 : A=USR(CONCLUDE)
5008 CD7F0A     00220 START2    CALL    0A7FH           ; TRANSFER END TO HL
500B 22FC4F     00230           LD      (4FFCH),HL      ; PLACE INTO MEMORY
500E 3A3D40     00240           LD      A,(403DH)       ; PORT FF OUTPUT MASK
5011 4F         00250           LD      C,A             ; SAVE OUTPUT MASK IN C
5012 2AFE4F     00260           LD      HL,(4FFEH)      ; GET START OF MEM. BLOCK
5015 ED5BFC4F   00270           LD      DE,(4FFCH)      ; GET END OF MEM. BLOCK
5019 D5         00280           PUSH    DE              ; AND SAVE VALUE ON STACK
501A 1608       00290 LOOP1     LD      D,8             ; NUMBER OF BITS IN BYTE
501C 7E         00300           LD      A,(HL)          ; GET VALUE FROM MEMORY
501D 5F         00310           LD      E,A             ; SAVE IT IN E REGISTER
501E AF         00320           XOR     A               ; CLEAR ACCUMULATOR TO 0
501F CB13       00330 LOOP2     RL      E               ; SEND BIT TO CARRY FLAG
5021 CB17       00340           RL      A               ; AND ROTATE 'ROUND TO A
5023 B1         00350           OR      C               ; USE THE PORT FF MASK
5024 D3FF       00360           OUT     (0FFH),A        ; AND SEND OUT THE VALUE
5026 0604       00370           LD      B,4             ; GET SHORT DELAY VALUE
5028 10FE       00380 DELAY     DJNZ    DELAY           ; AND DELAY SHORT WHILE
502A AF         00390           XOR     A               ; CLEAR ACCUM. BACK TO 0
502B 15         00400           DEC     D               ; BITS = BITS MINUS ONE
502C C21F50     00410           JP      NZ,LOOP2        ; AND BACK FOR SOME MORE
502F 23         00420           INC     HL              ; GET NEXT BYTE FROM MEM.
5030 D1         00430           POP     DE              ; GET STACKED END VALUE
5031 D5         00440           PUSH    DE              ; SAVE IT AGAIN
5032 E5         00450           PUSH    HL              ; SAVE CURRENT HL VALUE
5033 AF         00460           XOR     A               ; CLEAR THE CARRY FLAG
5034 ED52       00470           SBC     HL,DE           ; DO THE SUBTRACTION
5036 E1         00480           POP     HL              ; RESTORE THE MEM. VALUE
5037 FA1A50     00490           JP      M,LOOP1         ; AND GO BACK FOR MORE
503A D1         00500           POP     DE              ; CLEAR THE STACK
503B C9         00510           RET                     ; AND BACK WHEN DONE
                00520 ;
                00530 ;
                00540 ; ********************************************************
5000            00550           END     START1
00000 TOTAL ERRORS


DELAY  5028 00380   00380
LOOP1  501A 00290   00490
LOOP2  501F 00330   00410
START1 5000 00170   00550
START2 5008 00220
```

Program Listing 2. Playback-only module for speech synthesis. This assembly listing is used in conjunction with another program to reproduce selected words or syllables.

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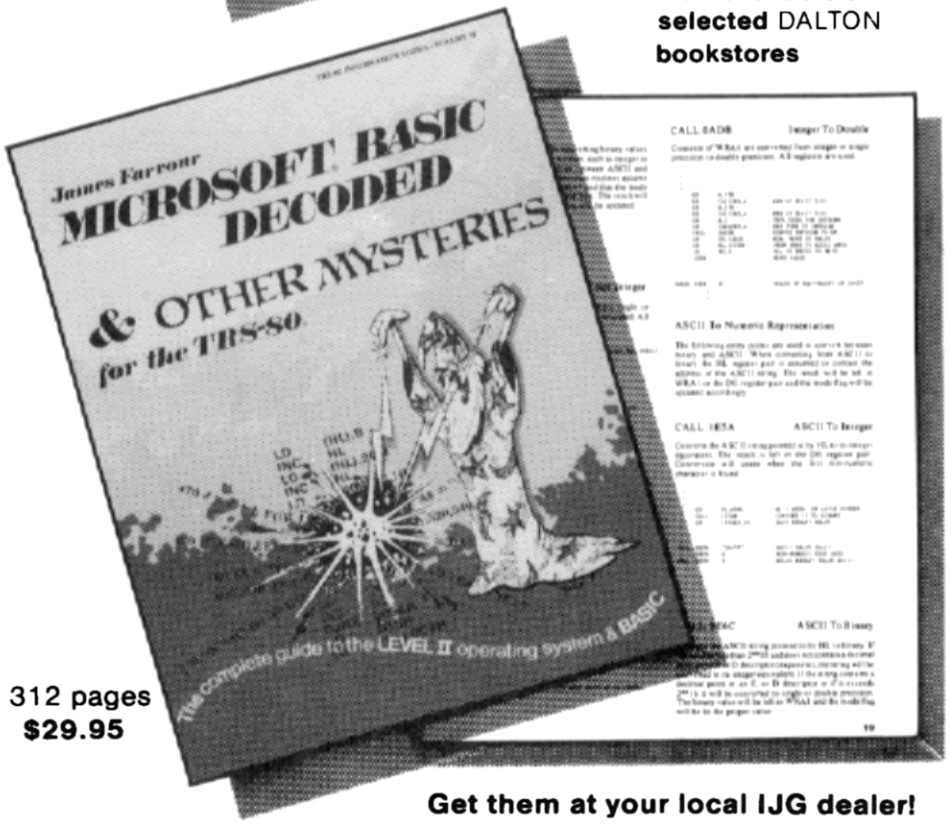

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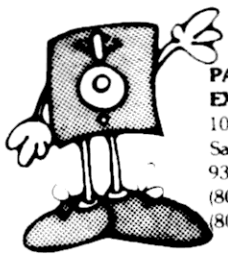

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the B-register delays entirely in the input section, as well as dropping the keyboard check for Break.

So there has to be a compromise to achieve memory economy. As written, Listing 1 samples at about 12,000 bits per second which is just enough to get understandable words. If the Model I hardware allowed sampling the actual relative *level* of the vocal sound (not just an absolute one-level or zero-level), then the sampling rate for voice could be dropped to perhaps 5,000 samples per second and achieve significantly better fidelity. But since those samples would be stored as relative levels, then at least four bits would be needed to store each very rough level (one part in 16). The result would be 5,000 samples per second times 4 bits = 20,000 bits per sample. That's 2,500 bytes for each second of sound, but it would be more intelligible sound.

This method can be achieved with the Color Computer because it comes with built-in level circuits—two analog-to-digital converters, each of which provides a 6-bit input value. Where is this converter? It is the joystick input. More on this in a later column.

Travel Greater Distances

After a year of hard use, the keyboard on my Color Computer has begun to show the strain. At first I was impressed: The key travel was short, so typing speed was increased; the layout was standard typewriter-style; the response was reliable and bounceless.

Alas, it didn't last. Some keys have begun to stick occasionally and response is irregular. The keybounce routine is in software, anyway. So why not hook up a "real" keyboard—one at least as real as that on the Model I? Both are matrix-type keyboards, the matrix is similar, and best of all the Color Computer keyboard unplugs. No soldering required. The Model I is also a full-travel, typewriter-like keyboard with normal rounded keytops.

All you need, then, is to find a replacement keyboard, some wire, and a plug-in header that mates with the Color Computer's keyboard cable. Where do you get a Model I keyboard? Well, many Model I

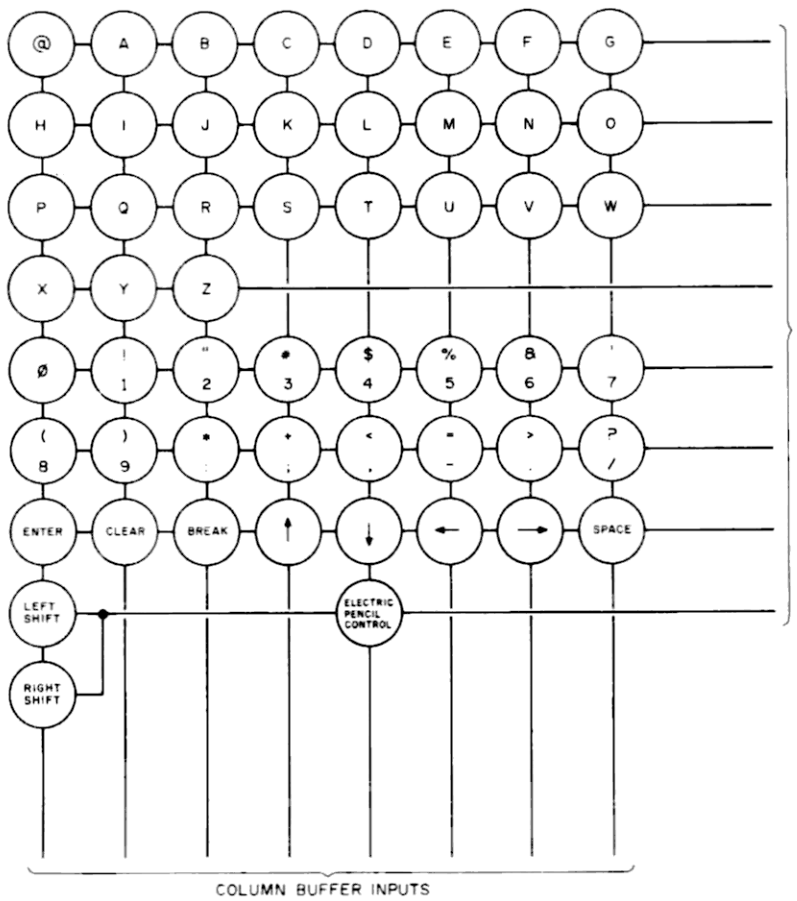

Fig. 6. Keyboard switch matrix of the Model I.

owners had their keyboards upgraded to avoid a keybounce problem for which no software had been provided in ROM, and lots of these keyboards are floating around. If you want one, contact your local Radio Shack, and ask the manager to call the Regional Repair Center. The keyboard is marked Hi-Tek 373-70100A and is listed in the Technical Reference Manual as 1700070. Ask for a keyboard pullout, not a new keyboard. Chances are you will pay the replacement cost of the Model I owner's upgrade—about $25, and well worth it for this keyboard.

Radio Shack's National Parts distribution system also stocks these keyboards, but only as completely reconditioned items for about $75. An alternative is

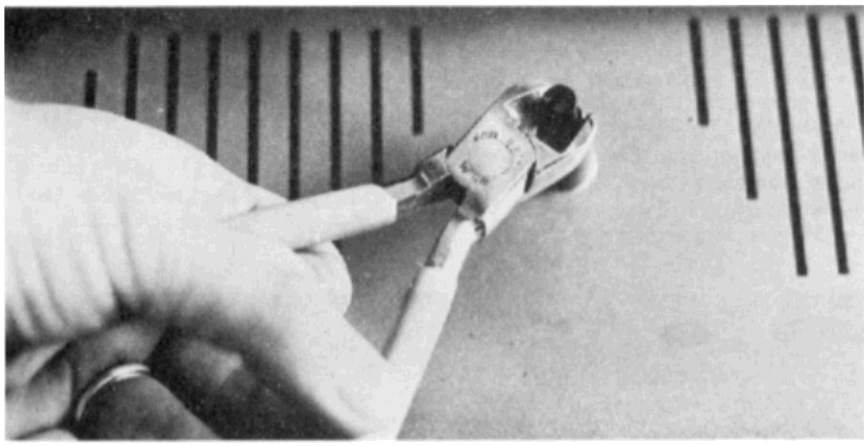

Photo 4. Cutting the center keyboard support post.

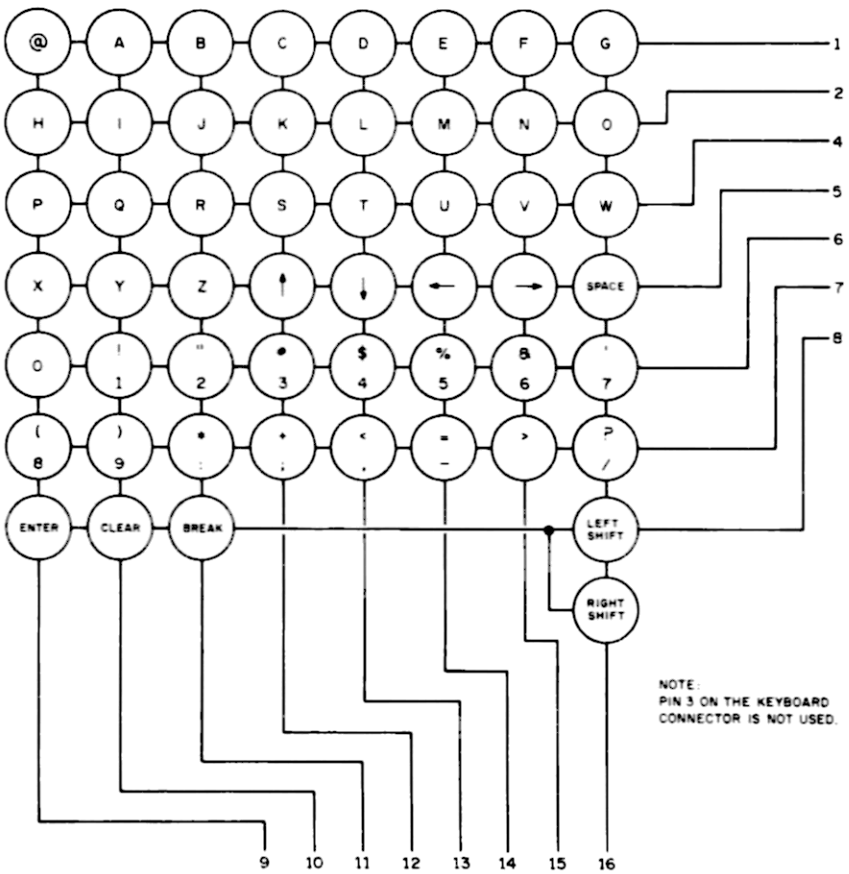

Fig. 7. Keyboard switch matrix of the Color Computer.

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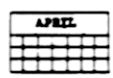

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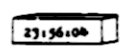

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Jameco Electronics (1355 Shoreway Road, Belmont, CA 94002, 415-592-8097), which sells a similar keyboard for $34.95. This is unwired, however.

You may be wondering why a keyboard with a keybounce problem would be useful. On the Model I it was a problem—but the Color Computer has its debounce routine in ROM. Even with the keyboard I obtained—dirty contacts, severe bounce on the Model I—no double letters occurred on the Color Computer.

The keyboard cable plugs into the header, a 16-pin, right-angle connector. You can obtain a 36-pin header (just snip off the extra length with scissors) from Digi-Key (Hiway 32 South, P.O. Box 677, Thief River Falls, MN 56701 800-346-5144).

```
10 INPUTX                        : REM * GET START MEMORY VALUE
20 INPUTY
                    : REM * GET END MEMORY VALUE
30 POKE16526,0:POKE16527,80      : REM * PLACE START ADDRESS
40 PRINTUSR(X)                   : REM * GIVE TO SUBROUTINE
50 POKE16526,8                   : REM * PLACE END ADDRESS
60 PRINTUSR(Y)                   : REM * GIVE TO SUBROUTINE
70                               : REM * ABOVE LINE EXECUTES TOO
80 GOTO 10                       : REM * AND DO IT AGAIN....
```

Program Listing 3. Basic demonstration program to produce speech output. The machine language program created by Listing 2 is embedded in its data statements.

Taking It Apart

The Color Computer is remarkably easy to open. Flip it over, remove the screws (including the one under the warranty label), turn it back over, and lift off the top. The keyboard is supported on plastic posts; it pulls off its cable (be gentle), and lifts out of the case. See Photo 3. Wrap it in bubble plastic and store it in case you ever need to reinstall it for Radio Shack repairs.

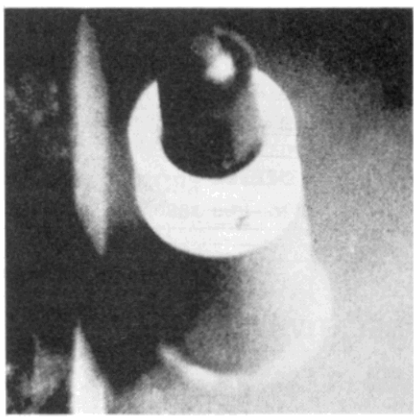

Photo 5. Grommets installed on the left and right support posts.

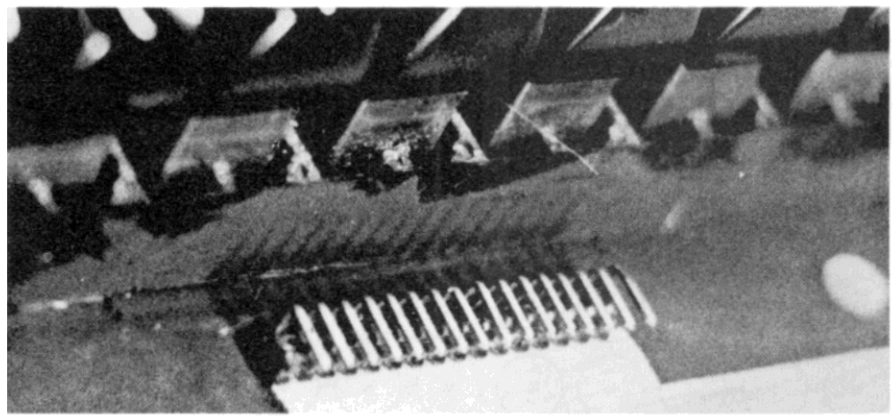

Photo 6. The header connector fitted onto the Model I keyboard.

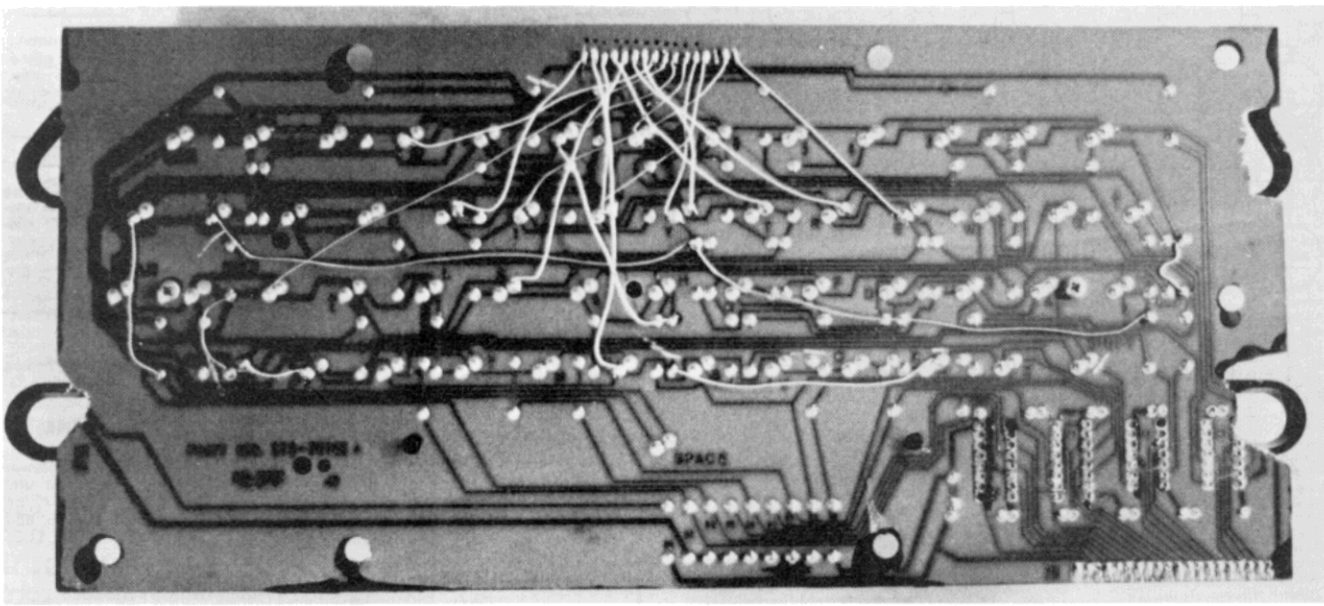

Photo 7. Back of a Model I keyboard modified for Color Computer use.

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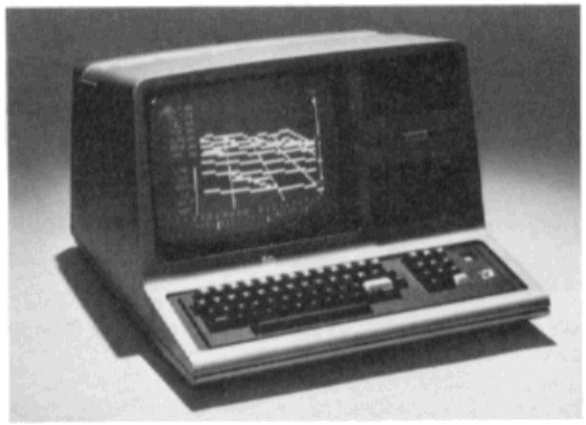

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Now for the minor surgery. Take a pair of wire snips and cut off the center plastic support post, at the point where its diameter changes from thin to thick (Photo 4). Cut two rubber grommets 3/8-inch high with 1/4-inch inside diameter, and slip them over the two backmost support posts (Photo 5).

Next turn to the Model I keyboard. (If you purchase the Jameco keyboard, you will have to wire the key matrix completely as shown in Fig. 7, and provide a baseplate for it.) About 1/2 way from the center back edge of the baseboard, drill a horizontal line of 16 holes spaced 1/10-inch apart; use the header strip for a guide. Push the header into place so the curved pins point toward the back of the keyboard (Photo 6).

Turn the keyboard over. Fig. 6 shows the keyboard matrix used in the Model I; it must be converted to the Color Computer's matrix, Fig. 7. There are only a few minor differences: The shift key has been moved, and a row of minor characters has been relocated to the end of an alphabetic row. The effect has been to reduce the matrix from 8 by 8 to 8 by 7.

First, remove the four integrated circuits on the keyboard; you will not need these. If they are in sockets, merely remove them. Otherwise, cut them out with snips or if you want to keep these ICs (four perfectly good ICs—two 74LS05s and two 74LS368s), desolder them. In either case, make sure none of the connections become shorted when you remove these parts. Also cut clean or desolder the remains of the keyboard interconnect cable. Finally, align the keyboard in the Color Computer case, and draw the outline of the four support posts on the edge of the keyboard. Saw or snip these out so the keyboard drops down on the posts, supported by the two grommets, the bottom post ridges, and the center post. Trim if necessary, then remove the keyboard. The keyboard is now ready to rewire.

Following Fig. 8, cut the keyboard traces found near B, C, X, right arrow, and right and left shift. Run and solder wires to the underside of the keypads shown, and to 15 of the 16 header pins that protrude through the board (pin 3 is not used). Any fine wire will do; wire-wrap wire (sold by Radio Shack) is best. Solder quickly, because these pads connect to the keyboard wiper contacts, and may be moved if the plastic housing is softened

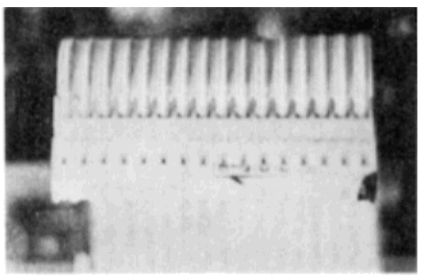

Photo 8. The header cable from the Color Computer CPU board.

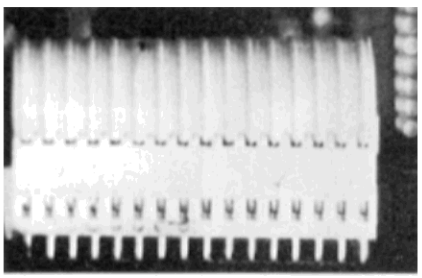

Photo 9. The header cable attached to the modified Model I keyboard.

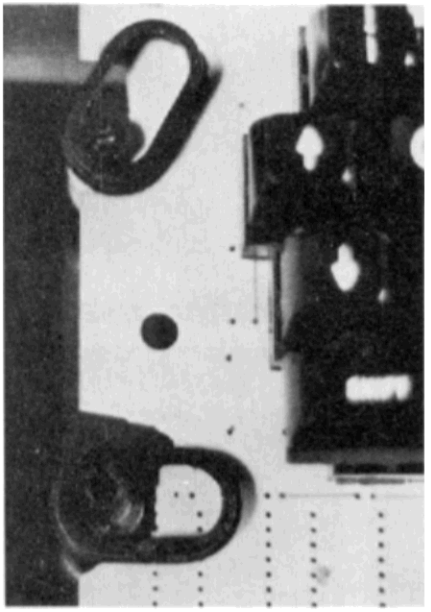

Photo 10. Support rings hold Model I keyboard onto the Color Computer support posts.

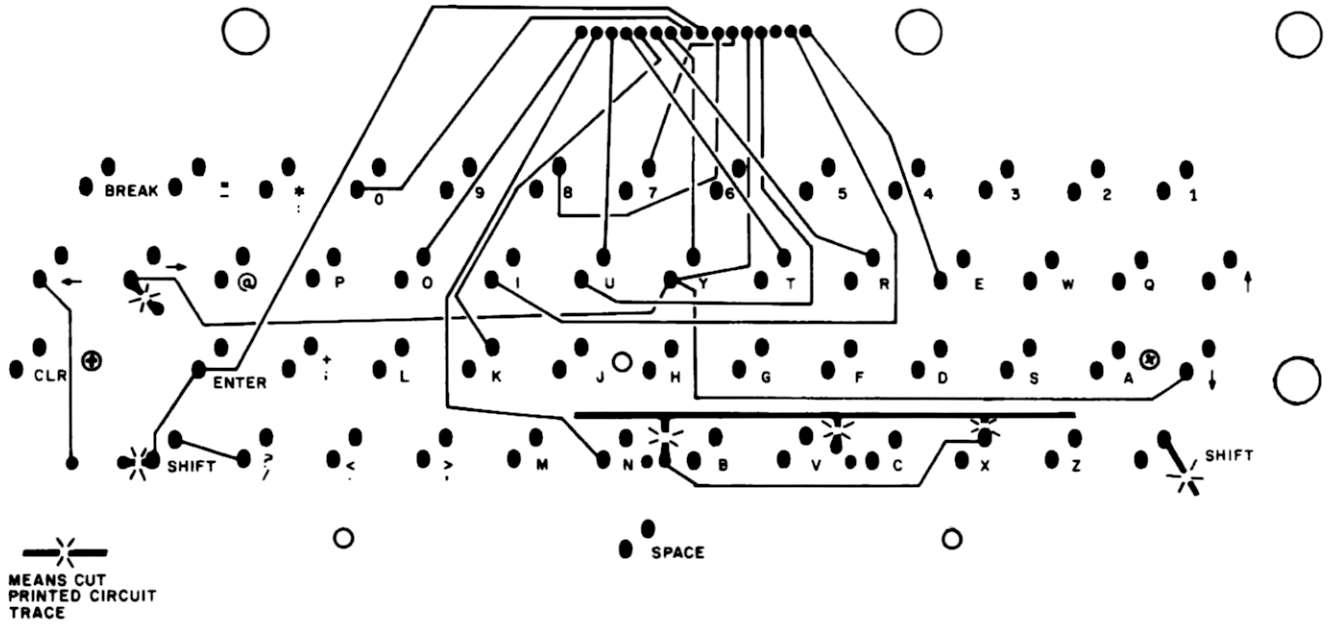

Fig. 8. Trace cuts and wiring interconnections needed to modify a Model I keyboard for use with the Color Computer.

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I'm Irwin Taranto, and I originally designed my Model II systems to work with TRSDOS, the operating software Radio Shack supplies with the TRS-80.

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from the heat. The resulting keyboard will resemble Photo 7.

Before the final assembly, insert the keyboard temporarily and attach the cable (Photos 8 and 9). Turn on the computer and test the keys; all should work. Missing keys mean missing wires; check especially around the broken traces for wires you have left out. Odd key patterns mean shorts; check the wire patterns, for splashes of solder, that all the traces indicated have been cut, and that the area is clean where the four ICs and interconnect cable were removed.

When all is well, test the "feel" of the keyboard. If you have done a clean cutting job around the support posts, the keyboard should remain stable as you type. If it does not, or if you just hacked away at the edge of the board (like I did), you may need plastic support rings. I found some oval rings just the right size in my junkbox labeled "miscellaneous plastic and other non-metal small bits & pieces," and glued them in place; since they were tall, they added considerable support (Photo 10).

Put the cover on the computer. The keyboard will protrude at about the right level, but it will be ugly because of the keyboard's cream-colored base, and the large spaces between the keys and the edge of the cover. Paint the base with a flat black latex and reinstall it (Photos 11 and 12). It will look like Photo 13. If this is okay with you, then the work's done. Otherwise, use Fig. 9 to cut a template out of black cardboard or soft plastic, and tape or glue it to the underside of the cover.

"It looks professional and feels like a real keyboard."

My installation is shown in Photo 14. It looks professional and feels like a real keyboard. The assembly is also sturdy enough to withstand ordinary household use. Nevertheless, keep the original keyboard handy. Your youngsters might give it a workout.

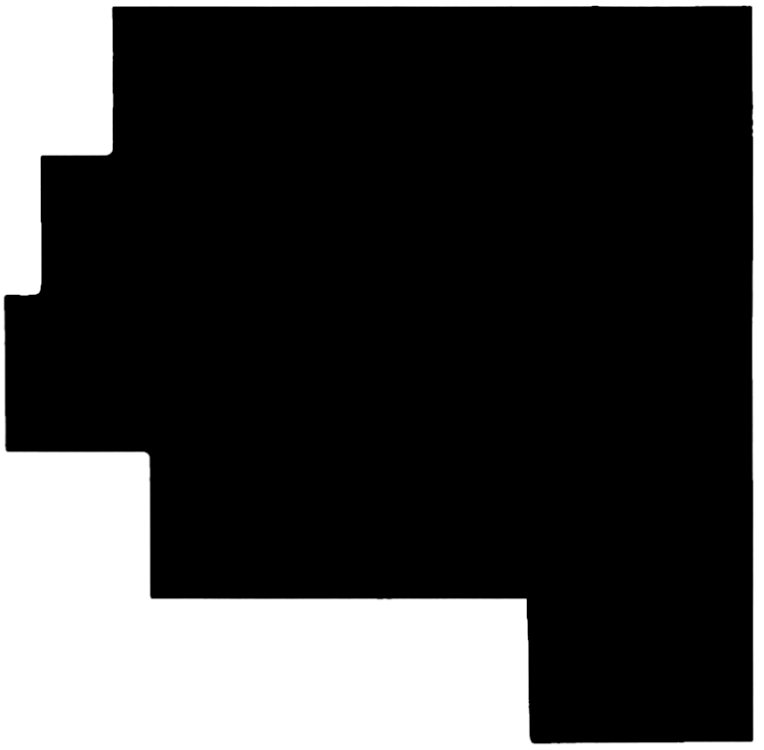

Fig. 9. Full-scale template for adapting the Model I keyboard to the Color Computer case cover.

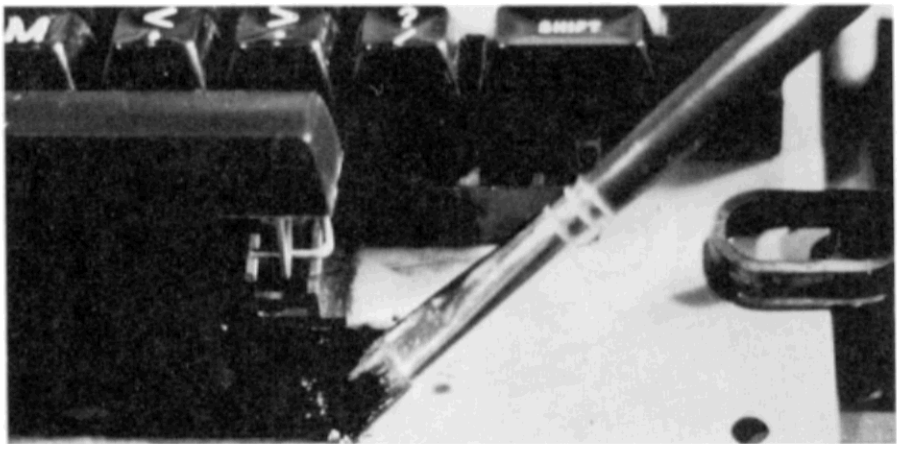

Photo 12. The modified keyboard installed in the Color Computer.

Information and Updates

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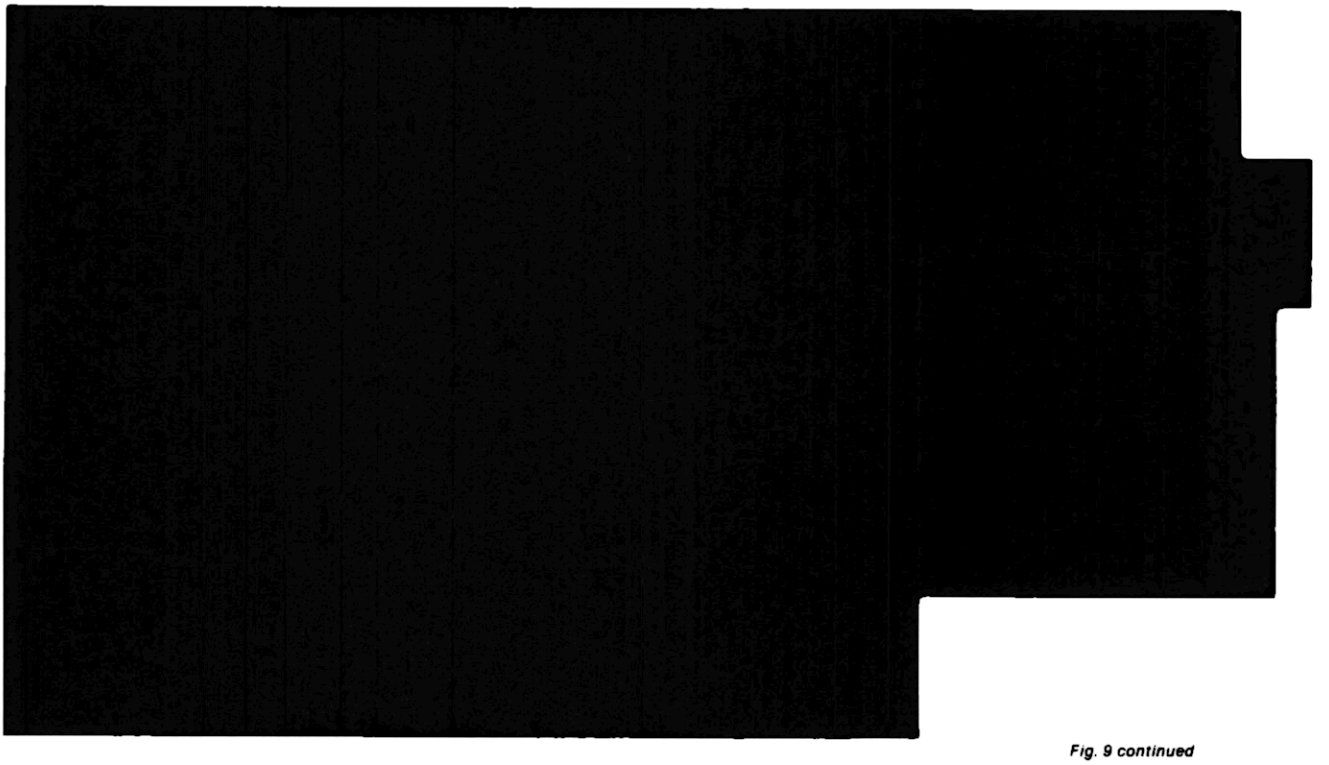

Fig. 9 continued

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Photo 13. The cover installed on the modified keyboard; there is a gap visible between cover and keyboard before template is in place.

Photo 14. The completed keyboard modification looks like a manufactured unit.

80 Applications Second Unscientific Reader Survey

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__More software, less hardware; how much/what?_____
__More Model I stuff. __More Color Computer stuff.
__Everything's okay!
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The software that I use (all/part, modified or to create other versions) which appeared in this column:_____

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duplicating room playing games? Thanks to Mike Barton and his intrepid associates at MSB Electronics in Barre, Vermont, for that information.

The following projects that have appeared in this column are available: The Memory Sidecar (February 1980); Micro Front Panel (May 1980); Color Computer Lowercase and Video Driver (November 1980); and this month's Cassette Speech Input Modification. PC layouts for updated versions of other Applications projects are found in "The Custom TRS-80." Write, enclosing SASE, for information.

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Upcoming

I planned to have a bubble-memory addition for the Model I and Color Computer available by this time (hence the teaser in November's "Upcoming" box). Unfortunately, the company I was dealing with (National Semiconductor) went out of the bubble memory business with only a week's notice, abandoning millions of dollars in investment, and following the lead of Texas Instruments and other major manufacturers who have dropped the product as uneconomical. My guess as to what's next? Fast, non-volatile, read/write memories. The newer static RAMs are so stable that I've turned on my 8K Ohio Scientific C1P after eight hours only to find better than 90 percent of the bytes in the Basic program still intact in memory. ■

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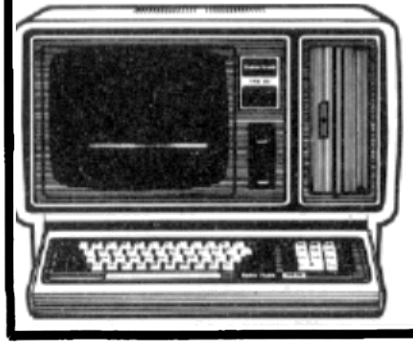

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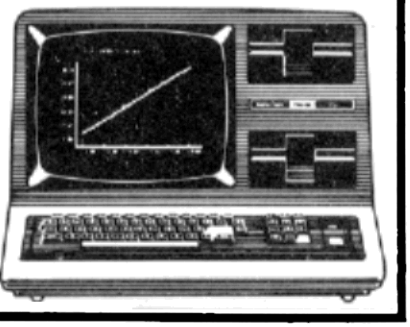

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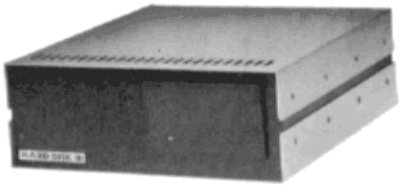

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EDUCATION 80

by Earl R. Savage

"Only one micro is the exclusive subject of two major monthly commercial magazines."

Last month, we discussed the arguments for placing computers versus terminals in the schools. We favor the microcomputer. Now, how do we decide which microcomputer is the best buy.

Micro vs Micro

It is natural for the uninitiated to ask, "Which microcomputer shall we buy?" The answer depends upon knowledge of computers and prejudices. When choosing a system it is irrelevant what the adjoining/biggest/smallest school district has bought. Evaluate products objectively to determine how they will meet your school's needs.

In this column I call my choice for a microcomputer Brand X. More Brand X micros are out there than all the others combined which is advantageous due to sheer numbers.

If one type of micro dominates the market, there are more users which means more programmers and programs. The more programs the greater the chance you will find what you need. Round 1 goes to Brand X.

You might expect that the larger the quantity of micros being manufactured by one company the lower the prices. If you comparison shop among micros of similar characteristics, you will find that round 2 goes to Brand X.

Brand X has a nationwide network of dealers who serve as sources of both equipment and supplies. It also has company-owned service centers across the country which offer maintenance contracts. That gives Rounds 3, 4 and 5 to Brand X.

Micros are divided into color and non-color categories. Black and white micros do not require internal or external color circuitry which produces a pretty display but adds absolutely nothing of value to 99 percent of its educational and business uses. The Brand X workhorses are black and white machines (though a small color model is available). Round 6 must be called a "semi-draw" since Brand X is not the only black and white machine.

Only one micro on the market is the exclusive subject of two major monthly commercial magazines which are independent of any manufacturer. These periodicals contain articles, programs and ads for sources of equipment, supplies and software—all for just this one brand. Score round 7 to Brand X.

At this point, we might as well call the bout. The decision goes to Brand X by a KO of all its opponents.

And which computer is Brand X? Well, if you don't know that, you had better delay your decision while you do more homework!

Flowcharting Revisited

A few columns back we discussed the need to flow chart your programs before actually writing them. The column pointed out the savings in time and frustration which flow charting achieves.

It also mentioned that making a flow chart of a program written by someone else can help you understand its operation.

"The real world is full of sounds so why should programs be silent?"

If you find flow-charting a program difficult help is available. The Documenter, from P80NUT Software (P.O. Box 490, Lilburn, GA 30247), is a System program which analyzes the Basic program of your choice. It then draws a flow chart of that program in a series of displays. You may copy the chart from the display or, if you have a printer of 64 or more columns, print all or selected parts of the chart.

The chart which is produced uses all the proper template shapes. For. . . Next loops are shown but due to limitations on the width of the display, other branches are not drawn. Instead, the line-destinations of the branches are given.

At the conclusion of the chart, the Documenter displays (and prints) a tabulation of all branches giving the from-line, the type of branch (GOTO, GOSUB, Then, and so on) and the to-line for each one.

Students may find The Documenter helpful in analyzing programs they are studying and in debugging a program.

Sound

Educators know that the more we stimulate the students' senses the more effective our teaching becomes. If this is the case, why do so few computer instructional programs utilize sound?

Integrated sound effects, as opposed to arbitrary noise, can give any program an added dimension of reinforcement (positive or negative). It can also attract and maintain attention. Many game programs, for example, incorporate sound with excellent results.

Sound effects can be written into any program and they can be added to any Basic program with ease. Adding sound can be as simple as a few commands through the cassette port to a small amplifier and speaker or as complex as intricate commands to an accessory device that produces actual speech or music.

If you are technically oriented or have a friend who is, you will be interested in an integrated circuit chip made available recently by Texas Instruments. This little 16-pin beauty is designed to be controlled by microcomputer signals. It contains three independent tone generators, a noise generator and an audio amplifier. The designation on the IC is SN76489.

At this writing, I have only studied the specifications and application notes of this chip. It appears to be quite easy to use. Apparently, it will do everything but talk and may even do that with proper programming.

Texas Instruments has put so much in this small chip that I will be surprised if we don't see it built into future computers. Surely, accessory sound units will be available at a reasonable cost. In the meantime, you can get ahead of the game by building your own.

However you generate them, sound ef-

fects can make a significant contribution to your instructional programs. The real world is full of sounds so why should programs be silent when you can add sound so easily? A bugle call can be sounded when the student successfully responds to a difficult question or test. A fog horn can signal an incorrect response.

These are a few examples of many possibilities. Let me know about your successes. I'll try to pass the information along to other readers. When you write, tell what you did, how you did it, and the student results. ■

A couple of readers have experienced difficulty with the technique for automatically setting the memory size given in the October Education 80 column. The problem does not usually arise because most programs contain a Clear statement. If you use the technique in a program which does not contain a Clear statement, there is a malfunction in memory sizing until that program has run twice. Simply insert a "Clear 100" statement after the POKEs have been made and the memory will be set properly.

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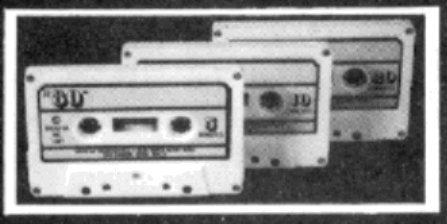

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Notes from BENEATH the KEYBOARD

by Paul Wiener

Hello, you folks out there in system-specific microcomputer journal land: I bet you're wondering who the hex I am. My name is Paul Wiener. I used to empty the bit buckets at Instant Software. Now I have my own column. How about that? From time to time, my column Notes From Beneath the Keyboard will appear in these pages.

The name is an allusion to Dostoevski's short story, "Notes From Beneath the Floorboards" (also translated as "Notes From the Underground"). I selected it to suggest I'm an intellectual sort of guy, oozing culture—a connoisseur of literature, art and music. But since you're kind enough to read my first column, I'll level with you: Strictly off the record, it's a hype. My idea of classical literature is more like the Golden Age of Donald Duck comics than Dostoevski.

The column will be devoted to programming tips, personality sketches of people in the industry, a little humor here and there, hardware and software reviews, questions and answers, and plain old gossip. As things progress, I hope you will become responsible for the contents of this column. Send me feedback about what you like and I'll do my best to stay popular (I know which side of the breadboard is etched).

Down to Business

Like other people, I have opinions and preferences. More to the point, four TRS-80 software products rank as my all-time favorites: LDOS (Logical Disk Operating System), which I reviewed in June 1981 *80 Microcomputing*; Master Reversi, available from Instant Software; Macro, an interpretive machine language monitor by Jake Commander; and Super Utility Plus.

Super Utility, written by Kim Watt of Breeze Computing, is a disk and memory utility selling for $50. Super Utility Plus is an expanded version and costs $75 (registered Super Utility owners pay only an upgrade fee to get Super Utility Plus). All features of Super Utility are also in Plus. The reverse, of course, is not true.

Even before Plus, Super Utility was one of my favorite pieces of TRS-80 software. I have used Superzap and played with Trakcess and several other disk utilities. Super Utility was so full of new, practical, exciting features that I soon abandoned the other programs.

In this review, I want to acquaint you with this versatile software tool.

Tables 1-8 are Super Utility's master menu and seven sub-menus. Tables 9-18 contain Plus' master menu and nine sub-menus. (The lowercase in the menus is not an oversight on our typesetter's part—if your system has lowercase, Super Utility will use it.) Judging a program by its menu can be deceptive. For instance, Super Utility's disk backup sub-menu is one entry longer than Plus'. But Plus' disk backup facility is as comprehensive as Super Utility's. The two sets of menus should give you a good idea of the power these programs bring to your fingertips as well as the differences between them. As you can see, both are rather large. The original Super Utility holds about 24K bytes of machine code. Plus is over 32K bytes long.

Though Super Utility's features are many, most Super Utility users agree on three special areas of outstanding usefulness: its superlative Disk Zap module, its high success rate at backing up backup-proof software and its ability to repair farkled disks. (According to Jesse

1. Zap Utility
2. Purge Utility
3. Disk Formatter
4. Disk Backup
5. Tape Backup
6. Disk Repair
7. Memory Utilities
8. Exit Program

Selection?

Table 1. Super Utility.

1. Display Disk Sector
2. Display File Sector
3. Display Main Memory
4. Compare Disk Sectors
5. Copy Disk Sectors
6. Verify Disk Sectors
7. Zero Disk Sectors
8. String Search
9. Sector Search
0. Single/Double Density

Selection?

Table 2. Zap Utility.

1. Kill Selectively
2. Disk Directory
3. Zero Unused Entries
4. Zero Unused Granules
5. Remove System Files
6. Kill Files by Category
7. Change Name/Date/Password
8. Change File Parameters
9. Remove ALL Passwords

Selection?

Table 3. Purge Utility.

1. Standard Format
2. Format Without Erase
3. Special Format
4. Read ID Address Marks

Selection?

Table 4. Disk Formatter.

1. Copy With Format
2. Copy Without Format
3. Special Copy

Selection?

Table 5. Disk Backup Utility.

Use Tape Player 1 or 2?

Table 6. Tape Backup Utility.

YOUR Family Tree

By Chuck Acree

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By Andrew P. Bartorillo

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By David Feitelberg

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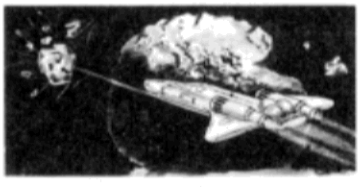

SPACE ROCKS

By Steven Kearns

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Bob Overholt, TRS-80 systems software authority and bit herder, farkled is "a software cowboy term for *messed up*.")

Farkle Repairs

There are two ways in which Super Utility helps you recover information (which may otherwise have been unsalvageable). One is its Format Without Erase feature. This can save the day if you are unable to access disk files due to CRC Error, Parity Error, Data Record Lost During Read, or Error in Data Field. Format Without Erase reads your disk, track by track, sector by sector and then writes it back. Not only the data is rewritten—so is the formatting information (ID address marks, track and sector addresses, data ID marks

1. Repair GAT Table
2. Repair HIT Table
3. Repair BOOT Sector
4. Read Protect Directory
5. Recover Killed Files
6. Check Directory

Selection?

Table 7. Disk Repair Utility.

1. DISK ZAP
2. DISK PURGE
3. DISK FORMAT
4. DISK BACKUP
5. DISK REPAIR
6. TAPE UTILITIES
7. MEMORY UTILITIES
8. FILE UTILITIES
9. CONFIGURE SYSTEM
0. EXIT PROGRAM

SELECTION?

Table 9. Super Utility.

1. Move Memory
2. Exchange Memory
3. Compare Memory
4. Zero Memory
5. Test Memory
6. Input Byte from Port
7. Output Byte to Port
8. Memory to Disk Sectors
9. Disk Sectors to Memory
0. Disk Track to Memory

Selection?

Table 8. Memory Utilities.

1. DISPLAY SECTORS
2. VERIFY SECTORS
3. COMPARE SECTORS
4. COPY SECTORS
5. COPY SECTOR DATA
6. ZERO SECTORS
7. REVERSE SECTOR DATA
8. EXCHANGE SECTORS
9. STRING SEARCH
0. SECTOR SEARCH
A. READ ID ADDRESS MARKS
B. ALTER DATA ADDRESS MARKS

SELECTION?

Table 10. Zap Utility.

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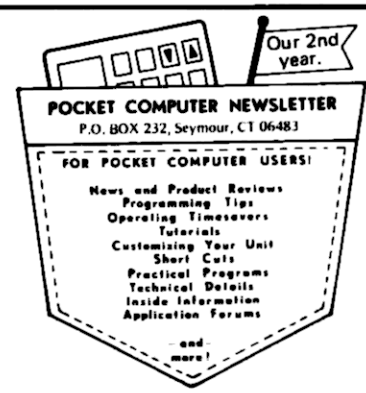

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and CRC's).

When Plus fails to read a sector properly, it pauses and prompts you for advice. If you select infinite retry, Plus will retry indefinitely. If Super Utility succeeds in reading the problem sector, it will rewrite it with a fresh format. If there is nothing physically wrong with your disk, the result should be a rejuvinated floppy easily read by DOS. If your disk does have a hard error, use the same infinite repeat feature to copy the data to another disk. Often, Super Utility's superior read routines pick up sectors lost to DOS without performing multiple reads.

If your disk is so farkled that some of it is unrecoverable, Super Utility will still reformat it. The information in the unreadable sectors is lost, but the data in the good sectors will be left intact. Files previously rejected by DOS, even though 99 percent good, may become loadable again. Only missing sectors have to be rebuilt by hand. The difficulty of rebuilding unrecovered sectors will vary according to your familiarity with the original contents, your experience at such rebuilding operations and the file type. The easiest files to rebuild are ASCII files, including ASCII saved Basic programs and most word processing and data files. Another use of Format Without Erase is to extend 35 track disks into 40 trackers.

Plus can also help save mangled disks by diagnosing and repairing bad directories and boot sectors. If a disk will not boot, or is prone to give messages such as Hit Error, Gat Error or Directory Read Error, Super Utility's disk repair module can almost certainly help. Super Utility will automatically fix faulty HIT's (Hash Index Tables) and GAT's (Granule Allocation Tables), re-read protect a directory and replace a clobbered boot with a very efficient new one. The Plus replacement boot is faster than those of TRSDOS or NEWDOS+; it may be worth while to replace even good boots. Plus understands and makes allowances for the idiosyncrasies of TRSDOS, NEWDOS 2.1, ULTRADOS, LDOS, DOS-PLUS, NEWDOS 80 and DOUBLEDOS in both single and double density.

If you killed the wrong file Super Utility can resurrect it for you. You have to restore it before another file gets written over it. The file must not have been killed by one of those nasty DOS's which erase dead directory entries rather than make them invisible to the system.

Backups

Super Utility's ability to backup protected software is somewhat controversial. According to its documentation, "This program's only intended use is for you to make Backups of your legally purchased programs. Please do not use this utility to make bootleg copies for others as authors of quality programs deserve their royalties." Super Utility backs up almost any TRS-80 disk or tape on the market. A notable exception is itself.

Software professionals are concerned about the high rip-off ratio of their products. As editor of a major software publishing house, I understand their concern: An estimated 15 copies are bootlegged for every one legally purchased. But as a fairly scrupulous software consumer, I fiercely resent the inconvenience vendors impose by impeding my ability to backup their programs. Magnetic media will not last forever. It stands to reason: The disk you use most will be the first to go. Although you cannot backup Super Utility itself, Kim has a reasonable support policy. For five dollars a registered Super

```
1. KILL SELECTED FILES        6. ZERO UNUSED ENTRIES
2. KILL BY CATEGORY           7. ZERO UNUSED GRANULES
3. REMOVE SYSTEM FILES        9. CHANGE DISK NAME
4. REMOVE ALL PASSWORDS       9. CHANGE FILE PARAMETERS
5. DISK DIRECTORY             0. CHECK DIRECTORY
SELECTION?
```

Table 11. Purge Utility.

```
1. STANDARD FORMAT            4. BUILD FORMAT TRACK
2. SPECIAL FORMAT             5. WRITE FORMAT TRACK
3. FORMAT WITHOUT ERASE       6. SOFTWARE BULK ERASE
SELECTION?
```

Table 12. Format Utility.

```
1. STANDARD DISK BACKUP       2. SPECIAL DISK BACKUP
SELECTION?
```

Table 13. Disk Backup Utility.

```
1. REPAIR GAT SECTOR          6. RECOVER KILLED FILES
2. REPAIR HIT SECTOR          7. MOVE DIRECTORY
3. REPAIR BOOT SECTOR         8. DISPLAY DIRECTORY
4. READ PROTECT DIRECTORY     9. CHECK DIRECTORY
5. UN-READ PROTECT DIRECTORY  0. CLEAR UNUSED ENTRIES
SELECTION?
```

Table 14. Disk Repair Utility.

```
1. READ TAPE                  3. VERIFY TAPE
2. WRITE TAPE                 4. COPY TAPE
SELECTION?
```

Table 15. Tape Utilities.

```
1. DISPLAY MEMORY             9. STRING SEARCH
2. MOVE MEMORY                0. INPUT BYTE FROM PORT
3. EXCHANGE MEMORY            A. OUTPUT BYTE TO PORT
4. COMPARE MEMORY             B. MEMORY TO SECTORS
5. FILL MEMORY                C. SECTORS TO MEMORY
6. REVERSE MEMORY             D. MEMORY TO TRACK
7. TEST MEMORY                E. TRACK TO MEMORY
8. JUMP TO MEMORY
SELECTION?
```

Table 16. Memory Utilities.

```
1. DISPLAY FILE SECTORS       8. DRIVE STATUS
2. COMPARE FILES              9. SECTOR ALLOCATION
3. COPY FILES                 0. BUILD FILE
4. DISK DIRECTORY             A. CLEAR FILE
5. FREE SPACE                 B. DISK ALLOCATION
6. OFFSET FILE                C. COMPUTE HASH CODE
7. FILE LOCATIONS             D. COMPUTE PASSWORD
SELECTION?
```

Table 17. File Utilities.

Utility or Plus owner can buy a backup from Breeze. You then own two copies. If one gets zapped, mail it to Breeze with $3 for another backup. If your disk was physically damaged, send Breeze $8 (along with the damaged disk) to cover the cost of the new disk and handling. A backup sent outside the USA costs $10. Super Utility may be upgraded to Plus for $25.

The tape copy utility uses both TRS-80 cassette ports (you need two recorders). The disk copy procedure requires only one drive, but progress is faster and smoother with a multi-drive system. Plus' special disk copy is more automatic and faster than Super Utility's. The programs backup protected disks in three passes. The first pass figures out the source disk's formatting irregularities. The second transfers the deciphered format to the destination disk. The final pass copies the data.

Disk Zap

Plus' Disk Zap module is a major program in itself. Like all programs in the Zap genre, it displays any disk sector in hex and ASCII and lets you modify the information. Like most zappers, it lets you step from sector to sector or track to track, but with differences. For example, the right arrow steps to the next higher numbered sector on the current track. If you happen to already be on the last sector, it wraps around to the lowest numbered sector on the next track. If you do not want this type of wrap around, use shift-right arrow. This will advance you to a higher numbered sector on the current track if there is one. Otherwise, it will give you a sector-not-found message. Plus will also skip directly to the highest sector on the track. If you are examining a protected or farkled disk and want to advance to the next valid, readable sector, press greater-than (>). Of course, symmetrical commands step to lower numbered sectors as well.

"It stands to reason: The disk you use most will be the first to go."

A key concept is flexibility. Further examples of this quality abound. You can enter information in decimal, hexadecimal, octal, ASCII or binary. In the disk modify mode, you can insert or delete characters as with Scripsit or the Electric Pencil. You can move the cursor with the arrow keys or you can send it to any relative byte in the current sector in one quick jump.

Like most zap utilities, Plus' Disk Zap Verify Disk mode attempts to read a disk, sector by sector, and reports the number of unreadable sectors. But Plus' versatile retry options again make it outshine its

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rivals. Here's how it works: When Plus encounters a disk I/O error, it offers you the following mini-menu: (R)etry, (S)kip, (C)ontinuous, (N)on-stop, (Q)uit. If Plus has trouble reading a sector the mini-menu is displayed. If you choose option (R) and it fails, Plus returns you to the mini-menu. If it succeeds, the verify operation continues. The (S) option skips the problem sector and continues the verify operation from the next sector. Choosing (Q) quits the verify operation and returns you to the Zap menu.

(C) and (N) are the infinite retry options. (C) makes Plus attempt to reread the bad sector until it gets it right. If you get tired of waiting for a successful read, pressing Clear terminates the attempt and brings you back to the mini-menu. If you let Plus go on reading and it finally succeeds, it will continue to verify the rest of the disk. If it encounters more problems in another sector, you return to the mini-menu.

(N) is similar to (C): (N) causes Plus to reread a problem sector until it succeeds. Then it will go on with the verify operation. But every time another difficult sector is encountered, instead of returning you to the mini-menu, Plus retries the problem sector until it succeeds or until you interrupt it with Clear.

Disk Zap's Read Data Address Marks and Alter Data Address Marks, on Plus only, are useful for protecting and unprotecting disks. It also has a decrypting mode to perform arithmetic and logical operations on each byte in the sector display. You can put it into a movie-mode and can even select the amount of delay between screen updates.

Other Allures

There are many other alluring features. You can screen-print the display at any time by pressing Shift Clear. Plus has a good spooler if your printer is slow. Or you can use Plus' dual mode to output simultaneously to video and printer.

Plus' System Configuration module lets you tell Plus how many drives you're using, the speed characteristics and number of tracks of each, the density of each disk in the system, the number of directory tracks and which operating system is formatted each disk. The configuration mode also lets you tell Plus if your printer prints lowercase or graphics, whether it's parallel or serial, and if it needs linefeeds. If you're using an MX-80, you can even let Plus know if its TRS-80 switch is in the TRS-80 position. If you have a high speed mod in your computer, you can inform Plus of that. The documentation includes directions on how to hard configure Plus (by zapping the Plus disk) to always boot up with your system's characteristics as the default configuration.

Plus must (pardon the expression) keep track of the location of each disk's directory because the File Utilities sub-menu offers an option to relocate your disk's directory to any vacant track. Another neat application of File Utilities is a file-oriented disk backup which will reorganize your disk. Each file is made as contiguous as possible instead of having multiple extents scattered over the disk.

The Disk Allocations option of File Utilities shows you a standard allocation map of your disk. For more detailed information about how your disk is utilized, two other options are available. File Locations tells you where on your disk each file is physically located. Sector Allocations prompts you to enter any track and sector you are curious about, and then reports what occupies that sector.

The Disk Purge section has some particularly interesting offerings. The Kill Selected Files option results in a directory filling the screen with the names of both non-active (killed) and active files. The inactive filenames are surrounded by graphics blocks distinguishing them from active ones. This directory is really a menu. You can move a cursor around the screen with the arrow keys. Position it over the name of an active file and indicate your desire to kill it by pressing K, or place the cursor over an inactive file and opt to restore it by pressing R. After all your decisions, pressing W will rewrite the directory, instating your revisions in one quick disk access.

"I believe Super Utility or Super Utility Plus should be present at every serious TRS-80 disk installation."

The Memory Utilities section has a memory window type monitor with display format and features similar to Disk Zap. As you can see from the menus, there are many other memory features. One cute one is Reverse Memory. Applying it to video memory (3C00H to 3FFFH) results in the display in Table 19.

A Jump to Memory feature is useful if you are writing your own routines to supplement Plus. Plus will list (to printer or video) over 350 subroutine entry points to help you call its routines from your own programs. A four sector patch area has been left vacant on the Plus disk for your own programs.

I believe Super Utility or Super Utility Plus should be present at every serious TRS-80 disk installation. The value of the convenience and hours saved by Super Utility (or Plus) is well worth the purchase price.■

```
:0!, S DEN, TRACKS = 35, DIR = 17, STEP = 3, DELAY = 2/2, HEAD = 00.
:1!, S DEN, TRACKS = 35, DIR = 17, STEP = 3, DELAY = 2/2, HEAD = 00.
:2!, S DEN, TRACKS = 35, DIR = 17, STEP = 3, DELAY = 2/2, HEAD = 00.
:3!, S DEN, TRACKS = 35, DIR = 17, STEP = 3, DELAY = 2/2, HEAD = 00.
FAST CLOCK = N, SAVE CONFIG = N.
PRINTER: GRAPHICS = N, LOWER CASE = N, MX80 = N.
PARALLEL, LINEFEEDS = N, DUAL = N.
# DRIVES ?
```

Table 18. System Configuration.

```
                                  YROMEM OT PMUJ .8
          YROMEM OT KCART .E        YROMEM TSET .7
          KCART OT YROMEM .D      YROMEM ESREVER .6
        YROMEM OT SROTCES .C        YROMEM LLIF .5
        SROTCES OT YROMEM .B     YROMEM ERAPMOC .4
        TROP OT EYTB TUPTUO .A   YROMEM EGNAHCXE .3
        TROP MORF ETYB TUPNI .0      YROMEM EVOM .2
1024 BYTES REVERSED.S GNIRTS .9    YROMEM YALPSID .1
KEY <ENTER> TO CONTINUE.
```

Table 19. Seitilitu Yromem.

PROGRAMMING TOOLS FOR YOUR TRS-80™ MODEL I AND MODEL III

INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Level II ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM useage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, a method of greatly increasing the speed at which data elements are stored on tape, and special precautions for disk systems. INSIDE LEVEL II is a clearly organized reference manual. It is fully typeset and packed with nothing but useful information. It does not contain questions and answers, ROM dumps, or cartoons.
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STEP80 allows you to step through any Basic or machine language program one instruction at a time, and see the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The top 14 lines of the video screen are left unaltered so that the 'target program' may perform its display functions unobstructed. STEP80 will follow program flow right into the ROMs, and is an invaluable aid in learning how the ROM routines function. Commands include step (trace), disassemble, run in step mode at variable step rate, display or alter memory or CPU registers, jump to memory location, execute a CALL, set breakpoints in RAM or ROM, write SYSTEM tapes, and relocate to any page in RAM. The display may also be routed to your line printer through the device control block so custom print drivers are automatically supported.
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This machine language program may be used as a smart terminal with time share systems or for high speed file transfers between two disk-based micros over modems or direct wire. It is menu driven and extremely simple to use. Functions include real-time terminal mode, save RAM buffer on disk, transmit disk file, receive binary files, examine and modify UART parameters, program 8 custom log-on messages, automatic 16-bit checksum verification of accurate transmission and reception, and many more user conveniences. Supports line printers and lowercase characters. With this program you will no longer need to convert machine language programs to ASCII for transmission, and you will know immediately if the transmission was accurate. This program comes on a formatted disk.
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PROGRAM INDEX VERSION 2.0

Assemble an alphabetized index of your entire program library from disk directories. Program names and free space are read automatically (need not be typed in) and may be alphabetized by disk or program. The list may also be searched for any disk, program, or extension; disks or programs added or deleted; and the whole list or any part sent to the printer. Printer output may be requested in three different formats including labels. The list itself may also be stored on disk for future access and update. It also includes a PURGE mode for quickly killing unwanted files. Directory reads and alphabetizing is done in machine code for speed. 1,000 programs may be sorted in less than 10 seconds. Works with TRSDOS, NEWDOS, and NEWDOS/80 single or double density. One drive and 32K required.
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INSTANT ASSEMBLER is absolutely unique among tape based assemblers in that it produces relocatable code modules that can be linked with the separate LINKING LOADER, which is supplied in two versions for loading programs into either high or low RAM. This lets you build long programs with small modules. INSTANT ASSEMBLER also features immediate detection of errors as the source code is entered, a compactly coded source format that uses 1/3 as much memory as standard source, and many operational features including single stroke entry of DEFB and DEFW, pinpoint control of listings, alphabetic listing of symbol table, separate commands for listing error lines or the symbol table, block move function, and verification of source tapes.
INSTANT ASSEMBLER's debugger provides single stepping with full register displays, decimal or hex entry of addresses, forward or backward memory displays, disassembly of object code in memory, memory display in ASCII format, and hex-to-decimal or decimal-to-hex conversion. The single-stepper will step one instruction at a time or at a fast rate to any defined address.
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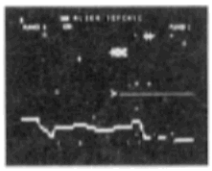

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Piloting your ship across the horizontally moving terrain, you must battle the various enemy spacecraft. You are under attack almost constantly from missiles and bombs, and to make matters worse, your ground patrol people are being picked up by the alien landers. To save them, you must shoot the landers and swoop down to "catch" the falling man. This fast action game requires skill and rapid reflexes. The model III version makes excellent use of that model's special graphic features.

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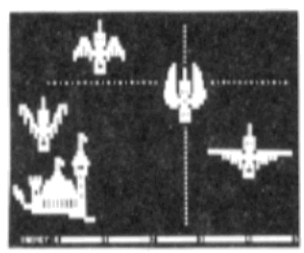

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16K tape...$19.95

SCARFMAN

From Cornsoft Group
Action-filled arcade game that pits you against the monsters. Race your Scarfman around a maze, gobbling up scoring dots. You are pursued by five monsters: if you eat a "+" they'll lower their eyes and you can eat them, otherwise they'll eat you!

With exciting graphics and sound, SCARFMAN may be played using the keyboard or Alpha Product's Joystick. WARNING: MAY BE HABIT-FORMING!

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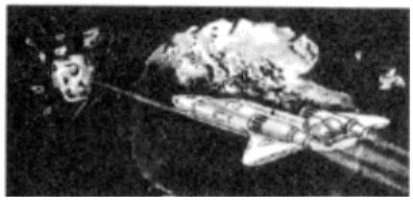


SPACE ROCKS

By Steven Kearns from Acorn

Gigantic antimatter rocks appear on the Tactical Display Screen of your spacecraft. You blast away with lasers and they just explode into smaller chunks. To score in this fast arcade game with sound, you must destroy the rocks. To stay in the game at all, you must avoid them!

To add to your woes, time bombs appear periodically. If their timers reach zero -- BOOM! And if that's not enough, the aliens will be glad to send out some spaceships loaded with antimatter torpedoes. Fire thrusters to move, shoot laser cannon, jump to hyperspace -- anything to avoid the onslaught. One or two players can compete, with five levels of difficulty.

16K protected tape...$19.95
32K protected disk...$19.95

By John Allen from Acorn

More features, thrills, and sound than even John Allen's famous PINBALL. Once you load ASTROBALL into your TRS-80, the arrow keys become flipper buttons, the screen becomes the play board, and you become the "Pinball Wizard!"

A flying saucer, spaceships, meteors, and black holes add to the fun as your ball realistically zings around the board. ASTROBALL will have all your family and friends lining up for the pinball action and challenge. Five skill levels.

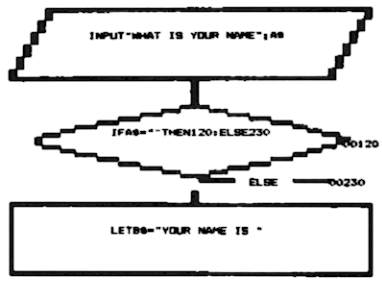
16K protected tape...$19.95
16K protected disk...$19.95

By Ainsworth & Baker from Microsoft

Speed up your programming and word processing with this excellent touch-typing instructional program. Divided into two sections, the program first teaches proper finger positioning. You practice keying various characters, the program adding new ones as you progress. In the practice paragraph section, you are evaluated for accuracy and rated in words per minute. The program continuously adjusts to your increasing skill, telling you which characters you miss and where you are slow. One of the most practical programs we know of for TRS-80.

Model I 16K tape...$14.95

THE DOCUMENTER



From P8ONUT Software

If you would love to be able to document your programs with a flowchart but lack the time, talent, or inclination, this program is for you. THE DOCUMENTER will produce a logical flowchart directly from any suitable BASIC program and print it on the screen or most lineprinters.

You get a flowchart and branch map that will help you follow program flow and aid your debugging efforts. Even memory-filling programs can be broken down into segments and flowcharted.

16K tape...$19.95 32K tape...$19.95
48K tape...$19.95
48K tape for disk...$29.95

YOUR Family Tree

By Chuck Acree from Acorn

A comprehensive genealogical program. It quickly and easily sets up a data base that holds name, date and place of birth, marriage and death information, plus a comment line for each ancestor.

YOUR FAMILY TREE will display/print a complete "pedigree" for any family member; a 3-generation chart may be displayed/printed showing the number of known ancestors beyond each branch of the tree. The program will also display a U.S. outline map showing migration across the country. You get full search capabilities on any key field. Capacities: 16K tape: 45-55 ancestors. 32K tape: 175, disk: 100. 48K tape: 300, disk: 225.

16K Tape or Disk...$29.95

MONEY MANAGER

By Andrew P. Bartorillo from Acorn

A complete management tool for the home budget, it accurately keeps track of your checkbook and provides an easy method of budget allocation. You can store information on up to 100 checkbook entries per month (250 with 48K), specify any automatic withdrawals, keep records of tax-deductibles, and record expenses by category. You can even break up charge account payments into the proper categories.

32K disk...$39.95

PERSONAL PROPERTY INVENTORY

By Southern Systems from Hayden

A special database system for your personal effects. This easy to use, easy to maintain program holds ITEM, DESCRIPTION, SERIAL NUMBER, and VALUE for each item. Especially useful for insurance and tax purposes. Capacities: 16K-100 records, 32K-300 records, 48K-500 records. For more storage, you can break down items into categories (stereo, photography, etc.) and maintain separate files.

16K tape...$14.95

ACCEL 2
BASIC COMPILER

From Allen Gelder

Turns your BASIC program into a machine language/BASIC hybrid that may run many times faster. For those who plan to sell their programs, compiling by ACCEL 2 offers the additional advantage of protection: the source code and REMarks are not included in the compiled version.

While all compilers may require some modification of the BASIC program (usually because of improper structuring), we have found that ACCEL 2 requires the least, and even works with program "tricks" like string-packing, etc.

ACCEL 2 works with models I or III, requires a minimum amount of memory, supports either disk or tape (with TSAVE, optional at $9.95), and does not require extensive rewriting of your BASIC programs. Unlike other compilers, no royalty is required when selling ACCEL-compiled programs.

Supplied on tape for 16-48K...$88.95

EDIT

From Allen Gelder

A powerful utility for editing BASIC programs. Allows full-screen, word processor-type editing to save you time and frustration. This machine language program loads into upper, protected memory and is invisible until invoked from the keyboard.

EDIT uses a command structure similar to the popular SCRIPSIT word processor, so it is easy to use right away. Block and global commands are supported, so deletions, replacements and other changes to the entire program are extremely easy to do.

16-48K relocatable tape for tape or disk systems...$39.95

DISASSEMBLER

By Roy Soltoff from Misosys & Acorn

A two-pass disassembler for TRS-80 that converts machine code to Z-80 assembly language listings. DISASSEMBLER produces symbolic labels with output to video, printer or tape (or disk in version 2 only). Radio Shack's Editor/Assembler will read and load the tapes for easy modification and reassembly. Extend the capabilities of Editor/Assembler with this utility. On tape for two different memory locations.

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Version 2...$19.95

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INPUT/OUTPUT

By James E. Keogh

I am presently designing my next home. I want to use the TRS-80 as a control center for the house. I would like to control lights, temperature, alarm systems and water sprinklers. I also want to tie in extra terminals for data retrieval. I have little electronic knowledge. I will not be able to do it all at once but want to wire the house to make my job easier when I can implement my ideas.

R.J.
Frankfurt, Germany

Radio Shack and a few independent suppliers offer modules to control any electrical device connected to your house wiring. This system is composed of a transmitter connected to the output port of your TRS-80. Upon receiving a signal from your microcomputer, the transmitter sends a signal through your house wiring to receiving modules near the electrical devices. The receiving modules plug into your house wiring like any other electrical device. The electrical device is plugged into the receiving module. Since each receiving module responds to specific signals generated by the transmitter, your TRS-80 can activate each module independently. This system operates similar to a timer.

As for the wiring in your house there are two important points to note. Your house wiring should be in good condition and all connections, from the box to each outlet, must be tight. A poor connection can cause a faulty signal.

Recently I purchased a Microline 80 printer. The printer does not advance the paper after printing a line. Before I go through the trouble of sending the unit around the country to get it repaired, do you have any hints?

D.W.
Luling, LA

Don't get too upset! From your description it sounds like someone on the assembly line jumped the wrong terminals in your unit. It takes about a minute to fix if you know which terminal to check. The best thing to do is to call the service department of Okidata Corporation at 609-235-2600. (They import and sell the Microline 80.) Ask to speak to a service representative. Explain the problem and tell the rep. you think an improper terminal jump was made. He should be able to talk you through the minor repair.

My friend owns a Model I and I own a Model III. He recently offered me the programs he has written. I do not know much about computers and do not want to destroy anything. Can I use these programs safely?

F.R.
Mt. Laurel, NJ

Your Model III is basically the same as your friend's Model I except that your unit is under one roof. There are other differences, but unless your friend got fancy, programs written for Model I can be used with Model III.

You have probably given plenty of advice on buying a microcomputer, but I want to get rid of mine. I have invested about $1,000 in the unit and after six months it is just sitting around. I feel like a child who has lost interest in a new toy. I do not want to lose any money. Any hints?

A.C.
Troutman, NC

Don't feel bad. You are not the first to jump into purchasing a computer too soon. There are two ways to sell your computer and not lose your shirt. You can try word of mouth or want ads. Contact a few professional computer programmers and mention you have a micro for sale. Be prepared to lose some of you investment; few buyers will pay full price for used equipment. Consider donating the microcomputer to your local school system. You may be able to take the donation off your taxes. First check with a tax accountant.

Help! I am ready to take a baseball bat to my printer. I bought the tape version of the Radio Shack mailing list program. My printer does not have an adjustable pin feed for the paper. I have to use double column peel-off address labels. But the program only prints in one column. Half the labels are going to waste.

R.S.
Farmingdale, NY

The best thing to do is print the first column then turn the sheet around so the second column is on the left side. Or change the printing instruction in the software to print in the two column format.

I read all the Radio Shack books on programming and understand the material but I am in a rush. I would like to write programs to use right away. I do not want to learn by trial and error. I know nothing difficult comes easy but is there any way I can speed up the learning process?

P.M.
Palmyra, IN

Obviously you cannot become a top programmer overnight, but there are a few tricks. You can, (for personal use only), borrow portions of existing programs. If you were designing a program which required pointing and firing a gun you can take a look at the TRS-80 Graphics book. Pages 129-131 have a program using this concept. By carefully combining portions of existing programs you should be able to develop your own programs quickly. One caution: Be aware of the copyright laws, especially if you borrow coding, develop a program and offer it for sale.

I own a small business and recently purchased a Model II. No software presently on the market fills my needs. It looks like I need a programmer who can understand my situation and give me results. Everyone I talked to knows all the languages except Basic. Do you have any suggestions?

F.K.
Schenectady, NY

There are a few steps you can take. Place an ad in the Help Wanted portion of your local newspaper, be sure to mention you have a TRS-80 Model II and need a programmer to code in Basic. Try your local computer store. There is a good chance computer store owners can put you in touch with someone. You might try your

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local university for programming students or professors looking to moonlight.

I get the strange feeling I am being taken for a ride when my Radio Shack store upgrades my computer. I could be wrong and have no evidence, only a feeling. Is it difficult to upgrade the computer myself? I know they sell kits.

P.T.
Bismarck, ND

Some microcomputer owners do upgrade their units themselves. Whether you can do it is another story. It depends on what upgrading kits you are talking about. Some only require you to slip in a circuit board while others require you to plug in a chip. It sounds simple but you have to know where to slip or plug it in. If you make a mistake you may have to purchase another kit. Depending upon the upgrading, many Radio Shack computer stores charge about $15-$25 for installation. For an extra $25 or so, you can have peace of mind that your $120 upgrading board was installed properly.

My local Radio Shack store insists I buy only top of the line tapes. Is this necessary?

E.K.
Seattle, WA

Top of the line tapes are not necessary. I have used tapes that sell for around $60 with no problems at all.

I do not live near a computer store and need to get my TRS-80 repaired. I originally purchased the TRS-80 while on vacation. Can you help?

B.J.
Coloma, CA

Locate a Radio Shack store in any major city. You can mail your keyboard to the store. Call the store to make arrangements before you ship. Package the keyboard and expansion interface, if you have one, in the original boxes. If you do not have the original cartons, make sure you use sufficient packing.

I tinker around with electronics, mainly radios and television sets. I have a general understanding about how computers work. I was wondering: Is it easy to repair computers?

S.J.
Newton, IL

Anything is easy once you know how. Microcomputers are no different. Some repairs require the replacement of component boards with little or no need to solder. If you know what to replace, it is easy. Some chips are easily replaced by lifting out the old chip and pushing in a new chip, the difficult part is knowing what needs replacing. Visit a computer store, drum up a friendship with the owner, and stand behind a technician repairing a unit. Ask a few questions and maybe you will be on your way.

For years I have been writing letters using a typewriter. A new ribbon costs under two dollars. I use a TRS-80 and printer, and it now costs me close to $20 for a new ribbon. Are they for real?

R.O.
Dillon, ID

You got caught up in the new economics of computer printers. Designers of computer printers either reinvent the ribbon drive to require special ribbons or purchase expensive rights to the ribbon system. In any case the customer has to pay. When you purchase a printer one of the things to consider is the cost of supplies. For example, the 80 Microline printer uses standard typewriter ribbons you can purchase at any stationery store.

I have been trying for months to obtain a tape version of the Editor/Assembler program from Radio Shack. I have had promises but no software.

R.T.
Wise River, MT

Apparently there has been a great interest in this software package. The stores should be getting more packages soon. Until then, make sure you ask the store to reorder the package from time to time.

I am ready to buy my first microcomputer, a TRS-80 Model III, but am unsure of what memory size to purchase. I do not trust the sales person who benefits if I buy an expensive unit. What do you suggest for a beginner?

D.J.
Mansfield, OH

The Radio Shack sales staff is pretty fair when it comes to microcomputers. They know once you become hooked you will come back for more. As for your problem, many people find the 4K TRS-80 is too small. The average is 16K. You can use most of the software with it. You will rarely need additional memory, assuming you purchase a tape drive system. A disk system requires 32K memory. If you need more, you can purchase the expansion interface.

I have a six year old daughter. I would like to get her started using my TRS-80, but would you trust a $1,500 computer to a six year old?

S.P.
Artesia, NM

Sure, as long as you get her started and help with the programs. I designed a simple, short math program for my six year old. I used few words since she still cannot read well. I sat through about a dozen runs with her and she caught on.

I have heard of microcomputer owners entering the computer service business providing computer runs for companies. I have never seen such an operation. Are the stories true? Is this something a TRS-80 owner can get into?

W.M.
Fairfield, CA

Providing outside computer support for business is a growing field. Whether you and other personal computer owners can really compete in this market is another question. Most small businesses find it less expensive to purchase a microcomputer than to purchase your service. But on a limited scale you may be able to offer your services to local clubs and organizations requiring mass mailings. You will not get rich but you can make a few extra dollars.

I have a TRS-80 Model I tape drive system. I was spending a lot of money for audio tapes. It seemed every time I wanted to record a program I had to purchase a new tape. A few computer people suggested I use a bulk eraser. I bought one from Radio Shack and for some reason it does not erase very well. Programs come out all wrong when I run them. What am I doing wrong?

J.L.
Decatur, IL

Loading a program on erased tape can be risky. Read the instructions again and follow them to the letter. You have to erase in a circular motion. Contact your Radio Shack store to find out if the bulk eraser is operating properly. There is a chance the eraser is strong enough for erasing audio but not strong enough for microcomputers.

I recently bought a TRS-80 keyboard with 16K memory at a garage sale. Now I have that plus my 16K unit. Is there any

Ask about our new form letter program!

PROVEN MONEY MAKERS FOR YOUR TRS-80*

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Provide your customers with a printed calendar (along with standard banker's holidays) of any month of any year...Useful in motivating history students. Holds the same fascination for students as a game. Tape only for Model I or III.

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- Maintain virtually an infinite number of disks all in continuous alph. or zip order...essential for large lists.
- Sort **2320** entries (2 full 40 track double density disks) in only 32K or an incredible **4640** entries (2 full 80 track double density disks) in only 48K!...Made possible with our unique date compression techniques on the Model III.
- Super fast sort by alph. or zip order (8 sec. for 1000 entries)...both orders can exist simultaneously on disk.
- High speed recovery of entries from disk...speed of sort is meaningless if retreival from disk is slow...ours pulls in over 11 per sec!
- Transfers old files over to our system.
- In zip order all entries with same zip code are also arranged alphabetically.
- Four digit zips have a leading "O" appended on labels.
- Backup data disks are easily updated as entries are created, edited, or sorted...extremely useful!!
- Optional reversal of name about comma for that non-computer, personalized look.
- Master printouts of your list in several formats (not just a rehash of the labels). Optionally continuous or page oriented...Your customers will want this!
- All Ø's in address labels are replaced by easier to read 0's.
- All labels optionally support an "Attn:" line.
- Many user defined fields with plenty of options for **simultaneous** purging and selecting...even allows for inequalities...powerful and easy to use!!
- Continuous display of how many addresses printed.
- Each disk entry automatically "remembers" how many mailings have been made for that particular entry...Can be tied in with purge/select.
- Primarily written in BASIC for easy modification... embedded machine code for those speed sensitive areas.
- Editing is simple and fast...automatic search.
- Optional 9 digit zip.
- Deleted entries have "holes" on disk filled automatically ...and alph. order is still maintained!
- Test label printing lets you make horizontal and vertical adjustments with ease.
- Optional "one time" mailing for some selected entries.
- Extensive use of error traps (both operator and machine induced)...even recovers from a power failure during a printout!...recycling on disk errors.
- Patch program allows you to upgrade the system to any DOS.
- Documentation manual available separately for $3.95.
- Hardware requirements: 32K printer, and 1 or 2 drives

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Football Scouting Report (Disk only) $89.95

How many high schools and colleges are there within a 75 mile radius of you? Did you know that each is a potential customer at the rate of from $500-$1000 per season? Many already subscribe to more expensive (but inferior) computer analysis services of their scouting reports. Using such a service a coach will typically have an opponent scouted several times prior to actually playing them...This series of programs was written to the specifications of a coach with two state championships to his credit. As a result, the emphasis is on producing statistics that will help in predicting what the opponent will do in a given situation...This is a sophisticated set of programs fully equivalent to that used by professional football teams...Hardware requirements...32K, 1 disk driver and printer.

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FAST SORT

(handles multiple dim. arrays)

and

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Sample Sort Times

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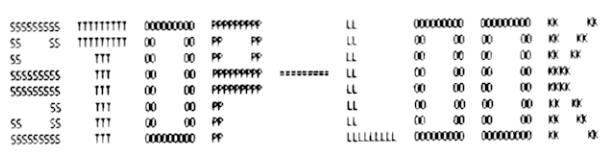

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way I can hook both keyboards together to give me a 32K unit?

T.F.
Baltimore, MD

I wish I could say it is that easy, but it is not. You have the makings of a 32K microcomputer but will have to do a bit more than connect a few cables. You need a housing similar to an expansion interface, internal buses in the housing and the appropriate ribbon cable. You also need an interface board. Most importantly, you need a top computer technician to make the necessary modifications. You may find it less risky and more economical to sell the second keyboard and purchase an expansion interface.

Should I open a computer store in my town?

J.P.
Queens, NY

The demand for microcomputers is growing. However, opening any business is risky. Talk to owners of computer stores and discuss your ideas with them. Most small store owners are willing to give you hints if you are not opening a store in their area. You should be able to support the store and yourself for at least a year without receiving income from the business. Above all, do not jump into business without investigating the opportunity.

I recently read advertisements for on-line computer services. You access these services with a modem and microcomputer. All they offer is out-of-town newspapers and stock services. Now how many people are interested in these? Are these services for real?

W.O
Warren, MI

Computer on-line time-sharing services may not be for every computer owner. Some predict these services to be the way of the future. In the future newspapers may not be printed but offered through microcomputers. You may receive mail through your computer. Most services are testing material. Some may not interest you but others still to come may. Give it time.

Please don't laugh at this question. Are there any programs available to predict a horse race?

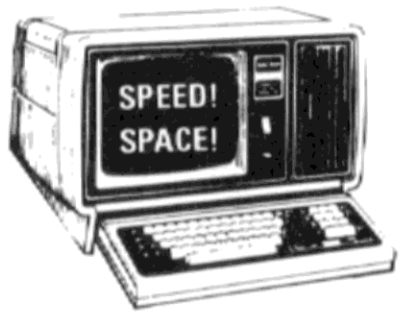
N.M.
Washington, DC

As a matter of fact, an *80 Microcomputing* editor recently told me of a manuscript on that very subject. If it has not yet appeared, it will soon.

I have heard a lot about computer animation. How can I create these programs?

R.J.
Greenville, MA

The concept of animation is not difficult to understand. Using your video display worksheet as a guide, you can draw a character or object on the computer. Then draw the same illustration as if it moved slightly. This progression continues drawing the same illustration with minor movements many times. When these steps are programmed into your microcomputer,



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JobStream CP/M 2.2 (with Z-80 Debugger)**	**$235**
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Z-80 Debugger Source Code	**$ 50**
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- TRS-80, Model II
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Federal Form 1040A
Federal Form 1040, pages 1 and 2
Schedules A, B, C, D, E, ES, F, G, R SE, TC
Forms 2106, 2219, 2210, 2441, 3468, 3903, 4625, 4726, 4797, 4835, 5695, 6251

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COMPUTER TECHNICAL SERVICES OF NJ

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the computer displays each drawing very fast. This gives the viewer the feeling that the illustration is moving. This technique takes artistic skill and a lot of time. Since you have to redraw the illustration time and time again you will probably need a good size memory.

I am thinking about buying a used TRS-80 Model III. Is it a good idea to purchase a used computer?

T.P.
Marion, OH

Is it a good idea to buy a used car? Sometimes it is and other times you are buying someone's headache. Test the equipment before you buy. Find out why the person is selling the unit. You might get the buy of a lifetime or just a lemon.

I have had my TRS-80 six months and already I am hooked I would like to join a computer club. Are there any in my area? Is there a directory of computer clubs?

I.G.
Charleston, VA

I have not located a computer club directory. Your best bet is to contact a few of your computer stores. They should know if there is one.

I'm in need of a program to give price quotations quickly and accurately. This type of program is unique to my business. Do you have any suggestions?

E.W.
Ames, IN

You can write the program yourself. Lay out the steps you use to develop a price quotation. List all your costs. Against each cost item indicate the item's price. If the price varies frequently use a variable character. When you write your program input all cost items first. Have the computer ask you questions concerning all the variables and prices that change frequently. After the data portion of the program is written, write the price quotations steps in a long equation. Have the computer ask about the changing items, calculate the price and give you your price quotation on a printed form.■

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JMC is proud to announce we have established a new Division to service the needs of the new **PERSONAL COMPUTER** market. We will be carrying a very complete selection of accessories for: the Radio Shack TRS-80's; Apple Computers; Atari Computers; and Commodore Pet Computers. This will include both arcade and regular games as well as business and educational programming, a wide variety of books from the beginners' level up to the most advanced levels, plus other accessory items. Our first Computer "**SOURCE BOOK®**" will be ready early in 1982, but you are welcome to write for a **FREE** listing of the products we already carry. As with our usual policies we would prefer that you order these items through your local retailer, but if all else fails, you may order directly from us. When you write, please give us the name of your local hobby shop/computer store so that we can forward them information about our wholesale program.

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215

FIXED ASSETS

Put your TRS-80 computer to work keeping track of all information related to your fixed assets and depreciation. This versatile system, developed by a CPA, will compute depreciation according to straight line, declining balance, and SYD methods and maintain the complete audit trail you need for financial and tax reporting, including fixed asset ledger and acquisition and disposal reports. You will be able to project depreciation for current and future years, use different methods for financial and tax reporting, switch from declining balance to straight line when advantageous, compute investment tax credit and additional first-year depreciation. Reports are available in both summarized and detailed formats, and can be organized by general ledger account, location, department, ADR class, and year of acquisition.

Currently available for the TRS-80 Model I with at least 32K and 2 disk drives, and for the Model III with at least 32K and 1 disk drive. Requires Disk Basic and a TRSDOS-compatible operating system.

FAAS-1 for Model I $149
FAAS-3 for Model III $149

TAB132

At last, here is the solution to LPRINT TAB problems with your TRS-80 Model I computer. Increase your programming productivity with this enhancement to Basic. Stop going through string manipulations and contortions trying to overcome the TAB(63) limitation. With TAB132, you will never again have to fret over tabbing past position 63 on your line printer. TAB132 will allow you to correctly tab to any print position up to 255 with the normal TAB( ) statement.

TAB132 is a machine language routine which occupies 100 bytes of memory, and will operate with either Level II or Disk Basic on the TRS-80 Model I. The TAB132 tape or disk includes modules for several different modes of operation. It can be loaded in the System mode or from DOS, can be loaded and run as a Basic program or merged into your Basic program and activated with a single GOSUB at the beginning of the program. System and DOS modules include a relocating loader to move TAB132 to anywhere in memory. Also supplied is a program which will patch the routine permanently into Disk Basic. Specify media when ordering.

TAB132 on tape . . . $12.95 on disk . . . $14.95

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60

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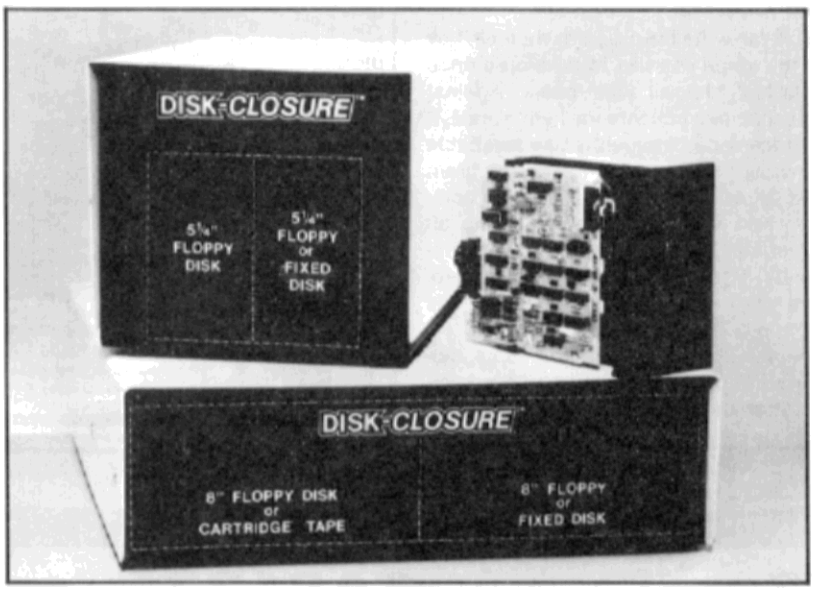
NEW PRODUCTS

Edited by Janet Fiderio

The January Feature—
Mesa Power's Disk-Closures.



The Disk-Closure Horizontal and Vertical models.

Disk Drive Enclosures

A standard line of disk drive enclosures, complete with an integral power supply, are now being marketed.

Horizontal or vertical "Disk-Closure" cabinets for both 5 1/4 and eight-inch, floppy or fixed disks, are available. Additional models are designed to accommodate a controller card. Eight-inch Disk Closures can also accommodate tape drive back-up systems as manufactured by Archive and DEI. All Disk-Closures have a fan, filtered ac input, and a lighted power switch. The chassis is constructed of black anodized aluminum with a beige painted steel cover.

Prices begin for the 5 1/4-inch model at $284. The same model with controller circuitry is $377. The eight-inch model prices begin at $371.50 and with controller circuitry rise to $412.50. For more detailed information contact Mesa Power, 7188 Clairemont Blvd., San Diego, CA 92111, (714) 569-7847.

Reader Service ↙ 185.

A Computerists Thesaurus

The Refware Thesaurus is a group of programs designed as a practical ready-reference resource to improve your reading and writing vocabularies.

A total of 12,400 nouns and adjectives arranged in associated groups will help you find the most appropriate word to express a specific meaning. These programs help replace overused common words with more precise and expressive alternatives.

The Refware Thesaurus Builder chains together eight utility programs, enabling you to create a specialized thesaurus tailored to the needs of your specific profession.

The first two programs, Adjectives 1.0 and Nouns 1.0, both retail for $39.95. The third program, the Refware Thesaurus Builder 1.0, retails at $149.95. For more detailed information contact David C. Whitney Associates Inc., Box 451, Chappaqua, NY 10514, (914) 238-8896.

Reader Service ↙ 328

A Word Processor For the MX-80

GB Associates is now marketing a word processor compatible with the Epson MX-80 printer. This program prepares text on your Model I or III for letters, form letters, advertisements, invoices, and other text material with complete editing capabilities.

This word processor allows you to select and change left margin, top margin, line length, page length, right justify, insert and delete lines, print with/without page and line numbers, use full Level II edit features, expand text to 40 characters per line or compress text to 132 characters per line.

This product retails for $75 and is available from GB Associates, Box 3322, Granada Hills, CA 91344.

Reader Service ↙ 338

IDM-X, An Interactive Data Manager

IDM-X is an interactive data-base manager.

Its basic components are a data-base initialization program, a report writer, and a report generator. Features included in the package are a built-in sort/merge; a fast key access method; the ability to support string, double-precision, floating decimal, integer, and date; and formatted numeric fields.

IDM-X requires a dual disk system with 64K and TRSDOS. It is priced at $399. For additional information contact Micro Architect Inc., 96 Dothan Street, Arlington, MA 02174, (617) 643-4713.

Reader Service ↙ 175

NEW PRODUCTS

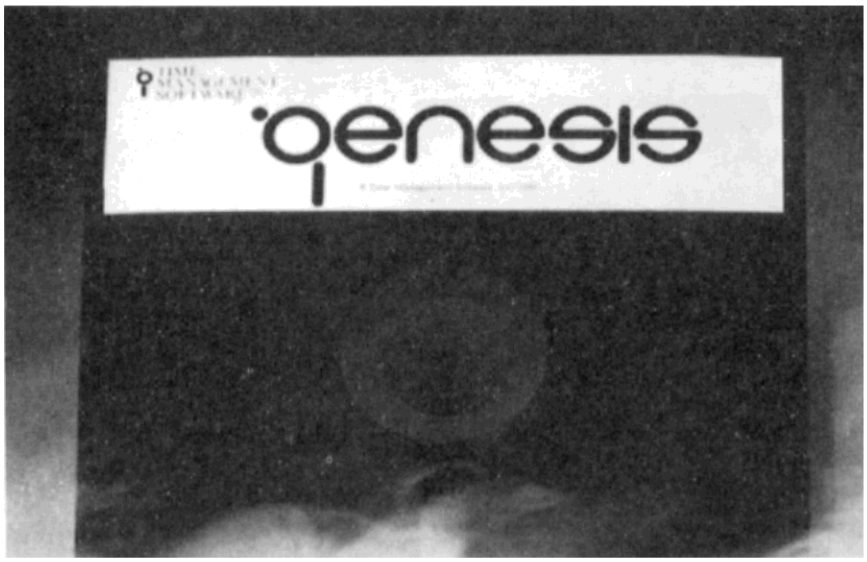
Mind Thrust

Mind Thrust lets you match wits with the computer.

The concept is simple: The first to complete an unbroken chain across the playing board wins. At each turn you must decide whether to add one link to your chain or attack the computer's chain. A special feature allows you to gain control over the computer's pieces. However, this means the computer has control over yours.

Mind Thrust is available for $16.95 and requires a 16K Level II machine. For additional information contact Hayden Book Company, Inc., 50 Essex Street, Rochelle Park, NJ 07662. (201) 843-0550.

Reader Service ↙ 178



Genesis.

Slim Package Disk Drives for the Model II

New slim-packaged eight-inch disk drives with plug-in compatibility are now available for the Model II.

The single-headed disk drives are capable of one megabyte of storage (unformatted), while the double-headed drives are capable of two megabytes (unformatted). These drives are one-half the width of standard eight-inch drives and operate solely from dc power. Track-to-track access time is three milliseconds. Additionally the disk drives incorporate two index sensors, allowing the use of single or double-sided disks directly.

This package is available from A. M. Electronics, 3366 Washtenaw Avenue, Ann Arbor, MI 48104, (313) 973-2312 and is priced at $695.

Reader Service ↙ 332

More Educational Games

Time Dungeon-American History is a five-game educational software package. It is designed to help you become more knowledgeable in five eras of U.S. history.

Your object is to map your way out of a dungeon, saving what little gold you have and gaining more, all by answering historically based questions.

Time Dungeons is priced at $24.95 on cassette and $29.95 on disk and is available for the Models I and III. For additional information contact Advanced Operating Systems, 450 St. John Road, Michigan City, IN 46360, (219)879-4693.

Reader Service ↙ 335

Genesis Writes Programs

Genesis is a program generator which accepts commands in conversational English. This software package's large memory capacity codes complex algorithms and generates efficient code in excess of four lines per minute.

The program is available for the Model II and is priced at $500. For more detailed information contact Time Management Software, 123 East Broadway, Box 727, Cushing, OK 74023, (918) 225-6340.

Reader Service ↙ 170.

Anticipate the Stock Market

The Market Tracker can be used by anyone trading in American stocks or stock options. The program creates a composite index of six popular technical market indicators to determine bullish or bearish swings in the Dow Jones Industrial Averages.

Market Trader is used in conjunction with its companion program, Stock Tracker. Both ensure that individual trades are in harmony with the market, reducing the number of whipsaws.

Market Tracker is available for the Model I and III for $190. For additional information contact H and H Trading Company, Box 549, Clayton, CA 94517, (415) 672-3233.

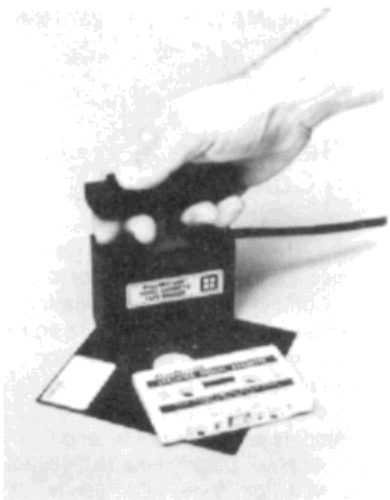
Reader Service ↙ 346

Erase Tapes or Cassettes of Previous Input

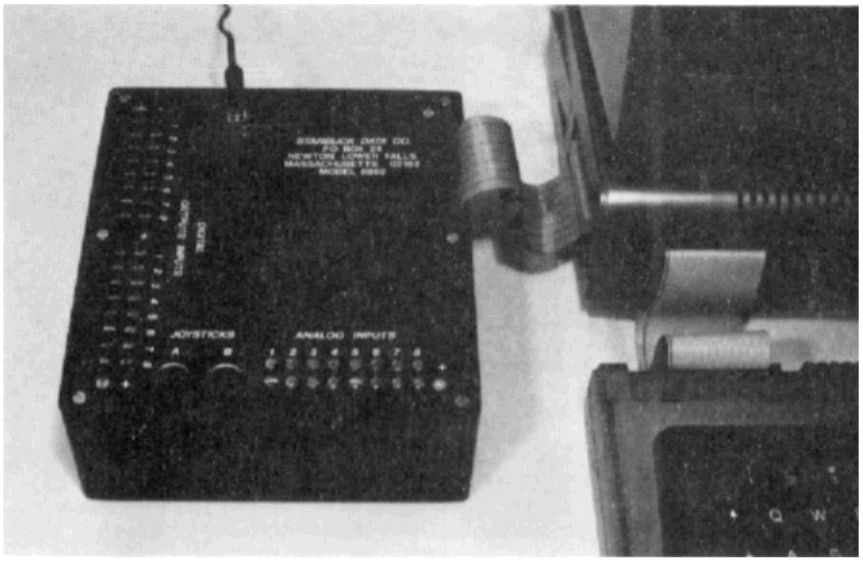
The Bulk Eraser, Model #24-017V, erases cassettes and disks of all previous data. The eraser is simply held over the cassette for a few moments to remove existing signals. Properly erased tapes and disks maintain maximum signal-to-noise ratio and prevent extraneous pulses from producing incorrect results.

The eraser is available from Robins Industries Corporation, 75 Austin Blvd., Commack, NY 11725, (516) 543-5200.

Reader Service ↙ 183.



The Bulk Eraser.



The 8882 Data Acquisition and Control System.

A Data Acquisition And Control System

The 8882 is a data acquisition and control system for the Models I and III.

The device includes eight digital inputs, eight digital outputs, eight 0–5V analog inputs with eight- (plus or minus one bit) bit accuracy, and two analog joystick ports. All inputs and outputs are fully protected. Software is provided for high-speed data acquisition of up to 4,000 points per second, and for low-speed acquisition in the interrupt mode, up to 30 points per second. The interrupt mode allows all data acquisition and control to be time-shared with normal use.

The 8882 is priced at under $200 from Starbuck Data Company, Box 24, Newton Lower Falls, MA 02162, (617) 237-7695.

Reader Service ↙ 326

Go Berserk With Color Berserk

Color Berserk is a high resolution graphics game on cassette for the 16K Color Computer closely duplicating the arcade game with sound effects and joystick action. A combination of angry robots and Evil Orville provide the challenge in this one or two player game.

Berserk is priced at $24.95 and is available from Mark Data Products, 23802 Barquilla, Mission Viejo, CA 92691, (714) 768-1551.

Reader Service ↙ 341

One-Disk Mail List Manager

The One-Disk Mail List Manager allows label printing and mailing for users with a single drive and 32K.

The Manager holds 430 records on disk —name, company, address (including the new nine-digit zip codes), a label-selecting print key and a special sort key. You may sort records alphabetically or by zip code in machine language, and print labels from an unsorted or sorted list. The program has many additional features.

For more information concerning the Manager contact Manhattan Software, Box 1063, Woodland Hills, CA 91365, (213) 704-8495. The Manager retails for $34.95 and is available for the Models I and III.

Reader Service ↙ 340

Dental/Medical Financial Management System

The Micro/SYS80 Patient Financial Management System is an accounts receivable, billing and record keeping system for medical and dental offices.

Daily, this system generates a reconciliation report, charge slips and the next day's appointment list. Patient receipts or third-party billing slips may be printed on either standard ADA forms or in Super-Bill format. Monthly, various billing and production reports will be generated.

The Micro/SYS80 requires a 64K Model II and is priced at $1,600. For more detailed information contact Micro/SYS80, 236 Waverly Road, Southampton, PA 18966, (215)335-5706.

Reader Service ↙ 345

A Dieters Delight

Compucal, of interest to dieters, is a set of two programs for the Model I and III.

The first program provides information concerning weight loss via the calorie reduction method. It charts both mens' and womens' average weights, helping you decide upon your own ideal weight and calorie intake. The second program, run at the end of the day, determines how well you met your daily calorie goal.

The package is available on cassette for $12, and on disk for $17, from Practical Programs, 1104 Aspen Drive, Toms River, NJ 08753.

Reader Service ↙ 349

Head Cleaning Kit

The Head Cleaning Kit removes microscopic particles of dirt, oxides and plasticizers from recorder heads, guides and capstans for optimum operation.

The Model 29-500 kit uses a Freon TF based cleaner. Applicators with chamois type tips get into hard to reach places.

For additional information contact Robins Industries Corporation, 75 Austin Blvd., Commack, NY 11725. (516) 543-5200. The kit is priced at $11.20.

Reader Service ↙ 180.

The Robins Head Cleaning Kit.

HOW ACCEL2 WORKS, PART 2

TRS-80 Model I/III BASIC Compiler

The ACCEL2 program has worked fine! I used it to compile a BASIC WORD PROCESSOR that was published in 80 MICROCOMPUTING in their MAY 1980 issue. It was necessary to go through all of the for-next loops because of the many jumps out of them and make corrections,but when that job was done the program worked fine. I am using it to write you this letter. The final program fits into a 32k machine.

ACCEL2 is amazing! I had bought an Othello game a couple of years ago, but never played it because of the interminably long time (2-3 minutes) it took the computer to make each move - no fun at all. Just for the heck of it I ran ACCEL2 on it, making NO changes whatsoever to the program, and the whole thing compiled at once with no tinkering! It then took about 10 seconds per move, so I added a single statement at the beginning to DEFINT A-Z, recompiled, and the result is just as good as an assembly-language program - only a couple of seconds per move!

I also wish to state that I think that ACCEL2 is an excellent product. I have modified Scott Adams' Backgammon game to compile under ACCEL2 as an example. The original BASIC program takes 30 to 40 seconds for the average move and can take as much as 4 minutes. The compiled version averages 2 to 3 seconds per move with a maximum move time of 9 seconds (all integer variables). That is significant!!

I'VE BEEN PLAYING WITH ACCEL2 FOR A FEW HOURS NOW AND IT SEEMS TO BE PRETTY GOOD. FOR EXAMPLE, MY LEVEL 2 VERSION OF RADIO SHACK'S CHECKERS GAME DRAWS THE BOARD IN 19 SECONDS AND MAKES THE SECOND MOVE IN 11 SECONDS. THE COMPILED VERSION DRAWS THE BOARD IN 11 SECONDS AND MOVES IN UNDER A SECOND (ABOUT 0.5). A PROGRAM TO GRAPH CUBIC EQUATIONS TOOK 8 SECONDS PER PLOT, WHILE THE COMPILED COPY TAKES LESS THAN 2.

I HAVE COMPILED ONE PROGRAM I USE RATHER FREQUENTLY: IT EXTRACTS INFORMATION FROM A LARGE DISK FILE (1320 64-BYTE RECORDS PER DISK) AND PRODUCES A REPORT. THE INTERPRETED VERSION OCCUPIES ABOUT 4600 BYTES AND TAKES 1.8 MIN TO EXTRACT INFORMATION FROM ONE DISK. THE COMPILED VERSION TAKES JUST OVER 8 MIN TO PERFORM THE SAME TASK. SINCE A TYPICAL REPORT INVOLVES ANYWHERE FROM 5 TO 25 DISKS, THIS IS A SUBSTANTIAL SAVING OF TIME.

ACCEL2: 32K TRS-80 Model I/III. Compiles selected subset in all variable types, local and global compilation options, output save to ES/F wafer, disk under TRSDOS, NEWDOS, NEWDOS/80. New functional improvements in place.

$88.95 + $2.00 shipping

Developed in Britain by Southern Software

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✓79

COLOR COMPUTER SOFTWARE

EDITOR ASSEMBLER DEBUGGER **$6.95**

CCEAD: This 8K Basic Program supports cassette files, has full cursor control, line insertion/deletion, and much more. Two pass assembler supports full 6809 instruction set & addressing modes, lists to screen or printer. Debugger allows memory examine/modify, program execution. At this price offered on an "as-is" basis, however, we've used this extensively in house and believe you'll be delighted. If not return within 2 weeks for a full refund. You get fully commented Basic source & complete instructions. Requires Ext. Basic & 16K. ..... CASSETTE $6.95

DELUXE TERMINAL PROGRAM

COLORCOM/E: This terminal program has everything! PLUS it's in a convenient plug-in cartridge. LOOK at these features.

- ONLINE and offline scrolling
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- And much, much more

Use with Compuserve, The Source, etc. Talk to other Color Computers. Works with any model Color Computer & full duplex RS232 modem. ..... CARTRIDGE $49.95

SECURITY: PrivateLine turns the color Computer into a secure communications terminal. Advanced encryption algorithm has billions of combinations. Talk to any similarly equipped Color Computer in absolute security. Requires full duplex modem. ..... CARTRIDGE $99.00

CUSTOM CARTRIDGES: Put YOUR Basic program into a convenient ROM Cartridge. It's easy! Runs instantly at power-up, frees up memory. Use for AD displays, schools, etc. Call or write for info. ..... FROM $41.65

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✓510

CONVERT YOUR SERIAL PRINTER TO PARALLEL

NEW MODEL UPI-3 SERIAL PRINTER INTERFACE MAKES IT POSSIBLE TO CONNECT AN ASCII SERIAL PRINTER TO THE PARALLEL PRINTER PORT ON THE TRS-80.

Software compatibility problems are totally eliminated because the TRS-80 "THINKS" that it has a parallel printer attached. NO MACHINE LANGUAGE DRIVER NEEDS TO BE LOADED INTO HIGH MEMORY BECAUSE THE DRIVER ROUTINE FOR THE UPI-3 IS ALREADY IN THE TRS80 ROM! SCRIPSIT, PENCIL, RSM 2, ST80D, NEWDOS, FORTRAN, BASIC etc. all work as if a parallel printer was in use.

The UPI-3 is completely self contained and ready to use. A 34 conductor edge card connector plugs onto the parallel printer port of the model I Expansion Interface or onto the parallel printer port on the TRS-80 III. A DB25 socket mates with the cable from your serial printer. The UPI-3 converts the parallel output of the TRS-80 printer port into serial data in both the RS232-C and 20 MA. loop formats.

SPEEDWAY ELECTRONICS ✓275
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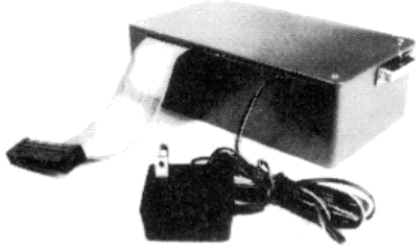


Switch selectable options include:

- Linefeed after Carriage Return
- Handshake polarity (RS232-C)
- Nulls after Carriage Return
- 7 or 8 Data Bits per word
- 1 or 2 Stop Bits per Word
- Parity or No parity
- ODD or EVEN Parity

NOW AVAILABLE FOR MODEL II

UPI-2 for TRS80 Model II	$149.95
UPI-3 for TRS80 Model I or 3	$149.95
UPI-4 for use with Model 1 and RS Printer Interface Cable (no expansion interface required)	$159.95
Manual only (may be applied to order)	$ 5.00
Ten day return privilege — 90 day warranty	
Shipping and Handling on all orders	$ 4.00
Specify BAUD rate 50-9600 BAUD	

✓See List of Advertisers on page 402

NEW PRODUCTS

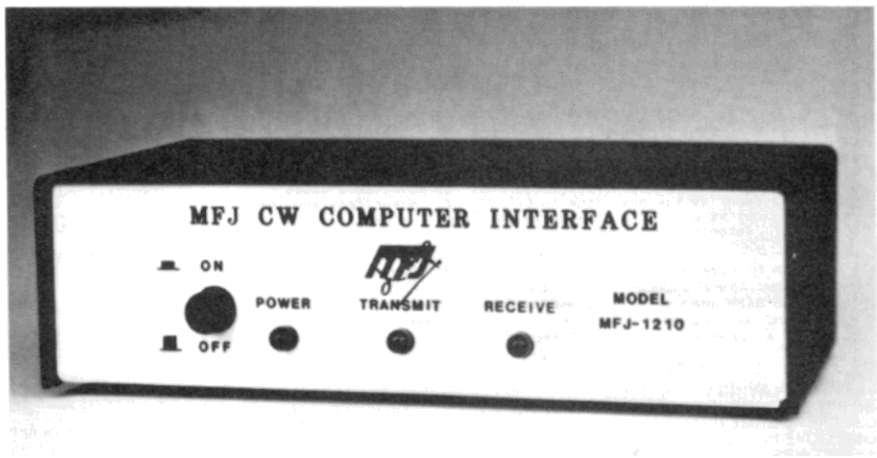
New Double-Density Circuit Board

The Multiplier, a new double-density circuit board for the Model I, allows reliable conversion from single to double density.

The circuit is 100 percent compatible with existing double-density hardware and software, and is easily installed by plugging the board into the expansion interface. The Multiplier features an advanced design of the data separation circuit which incorporates a phase-locked loop.

This product is priced at $99.95 and is available from A.M. Electronics, 3366 Washtenaw Avenue, Ann Arbor, MI 48104, (313) 973-2312.

Reader Service ✓ 334



The CW Computer Interface.

Educational Software From Advanced Operating Systems

The Mostly Basic Educational Package is written in Basic and contains several programs. The tutorials include: a spelling and flash card test for French, German, Italian, and Spanish; a speed reading program; two math programs; the Visual Perception Test; and the Memory Challenger.

This package is available for the Model I and III on disk for $29.95 and cassette for $24.95. Contact Advanced Operating Systems, 450 St. John Road, Michigan City, IN 46360, (219) 879-4693.

Reader Service ✓ 162

Hardware Printer Interfaces

Two new hardware printer interfaces, STP-1 and STP-2, for use with the Color Computer and a conventional parallel type printer are now being marketed.

This interface allows use of a Centronics-compatible printer with the Serial RS-232 port of the Color Computer. By plugging in the interface the computer "sees" a serial printer while the parallel printer "sees" a parallel port. The STP-1 accepts serial data from the computer at a rate of 600 baud. The STP-2 has switch-selectable baud rates compatible with the computer.

STP-1 is priced at $79.95, STP-2 at $99.95. For additional information contact Multi-Media Systems, Inc., Box 41084, Indianapolis, IN 46241, (317) 839-6150.

Reader Service ✓ 336

Morse Code Transceive Program and Hardware

The MFJ-1210/1212 CW Transceive program and Hardware lets you send Morse Code on your keyboard and receive it on your display screen.

It features a tri-split screen for received messages, a transmit buffer and a programmable message index. You can preload the text buffer and transmit when ready. This program has ten 199 character programmable message memories with an on screen message index. You can repeat and combine these messages as needed. Speed is adjustable from 12 to 55 words per minute. For group code practice 2200 characters can be stored. The hardware interface plugs between the transceiver and computer, no modifications are needed.

This program requires at least 16K of RAM and a Model I or III. It is priced at $99.95 from MFJ Enterprises Inc., Box 494, Mississippi State, MS 39762.

Reader Service ✓ 172.

New Journal For Educators

A new periodical for educators using computers to teach mathematics and science is now available. *The Journal of Computers in Mathematics and Science Teaching* contains Features of interest, New Products, Editorials, Updates, and more.

This quarterly journals' subscription price is $7 per year. Contact *The Journal of Computers in Mathematics and Science Teaching*, Box 4455, Austin, TX 78765 for information.

Reader Service ✓ 160.

AMHost Turns Your Model III into a Stand-Alone Host

The AMHost software allows the Model III to become a stand-alone host for access via telephone by another computer or terminal. This permits a remote user to assume complete control of your computer.

Provisions for translation tables have been incorporated, permitting user-definable translation codes should non-standard ASCII codes be desired.

AMHost is available from A.M. Electronics Inc., 3366 Washtenaw Avenue, Ann Arbor, MI 48104, (313) 973-2312, for $24.95.

Reader Service ✓ 333

Pac Attack

Pac Attack is an arcade game now available for the Color Computer.

Three little muggers chase your man relentlessly around a maddening maze as you furiously try to build up points. Graphics, special sound effects, and three levels of skill are featured.

Pac Attack, priced at $24.95, is available from Computerware, Box 668, 1472 Encinitas Blvd., Encinitas, CA 92024, (714) 436-3512.

Reader Service ✓ 177

TRS-80 MODEL I EXPANSION

LNW SYSTEM EXPANSION BOARD.....$ 350
32K, FLOPPY CONTROLLER, REAL TIME CLOCK, PARALLEL PRINTER, RS/232 20MA I/O.

RADIO SHACK EXPANSION INTERFACE
0 K...$ 270 16 K...$ 310 32 K...350

UPGRADE YOUR EXPANSION INTERFACE WITH 4116 200 NS MEMORY CHIP, INSTALLED & TESTED.
16K.....$ 40 32K.....$ 80

TRS-80 MODEL III

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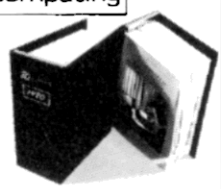

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Thank you and enjoy your subscription.

✓See List of Advertisers on page 402

NEW PRODUCTS

Disk Connector-Cable Assemblies

A new line of reliable disk connector-cable assemblies for the Model I are now being marketed.

These assemblies have gold-plated contacts and tightly fitting connectors and are available for one through four disk drives. Prices range from $39.95 to $59.95.

For more information contact Multi Media Systems, Inc., Box 41084, Indianapolis, IN 46241, (317) 839-6150.

Reader Service ↙ 337

A Program For Preventative Maintenance

PM-Status II keeps track of your equipment and vehicles with preventative maintenance schedules.

The program singles out equipment overdue for scheduled maintenance work and keeps records by hours, miles, date or both. Complete maintenance records for one, a selected group, or all equipment can be displayed or printed at any time.

PM-Status retails for $395 and is available for the Model II from Anawan Computer Services, 19 Winterberry Lane, Rehoboth, MA 02769.

Reader Service ↙ 343

Computer Soft-Ware for Librarians

The Library Process System is a librarians tool with time saving and organizational capabilities.

Designed by a professional librarian, this package features the ability to print catalog cards, book lists and AV catalogs. It also does subject searches.

This system is designed for a Model I or III, 32K, two-disk system with a tractor-feed line printer. It is priced at $125 and is available from Educomp, 919 West Canadian Street, Vinita, OK 74301.

Reader Service ↙ 163.

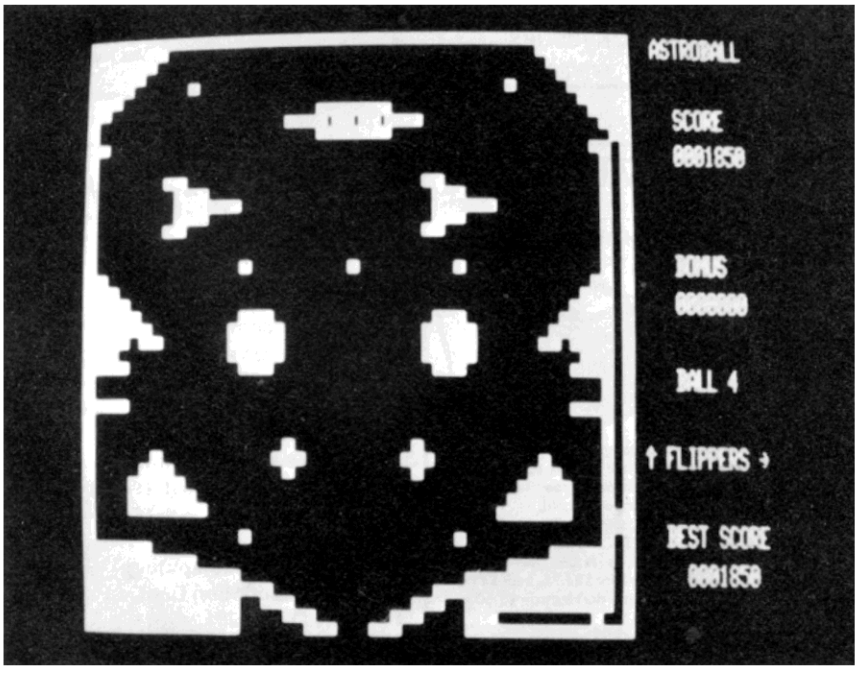
Astroball— Pinball For Your Micro

Astroball is a pinball game with a space theme for the Models I and III.

It features various spacecraft, flying saucers and mysterious black holes that under certain conditions may prove dangerous. Your role is to destroy as many meteors as possible.

Available on 16K tapes and disks for $19.95; direct inquires to Acorn Software Products Inc., North Carolina Avenue, S.E. Washington, DC 20003, (202) 544-4259.

Reader Service ↙ 329



An Astroball Video Screen Display.

Book Covers the DOS Random Access

DOS Random Access & Basic File Handling is a self-instruction tutorial. The material is presented in a down-to-earth manner easily understood by anyone with some Level II experience.

This 150-page manual (priced at $24.50) enables any non-programmer to write special programs for inventories, mailing lists, record keeping, research project data manipulation and more. A compatible disk is also available.

For more detailed information contact DSC Publishing, Box 769, Danbury, CT 06810, (203) 748-3231.

Reader Service ↙ 348

A Business Development System

Quic-N-Easy is a programming system that ties together formatted, edited, data entry with processing, printing and sophisticated file handling. This screen-format oriented application development system is designed for the fast production of bug-free professional-looking custom business applications.

It is available for the Model II and III and is priced at $395. For additional information contact Standard Micro Systems Inc., 136 Granite Hill Court, Langhorne, PA 19047, (215) 968-5966.

Reader Service ↙ 164.

Test Your Managerial Skill

Management Decisions is a business-oriented simulation that places you in the shoes of a pajama-manufacturing executive competing against a rival manufacturer.

Based on a five-year plan, business world realities such as sales force size, advertising costs, credit terms, pricing, inventory, plant capacity and manufacturing are the competitive tools you have the options of using. The computer allows you to see the relationship between cause (decisions) and effect (consequences).

The tape version of Management Decisions is priced at $49.95, the disk version at $54.95. Both are available from The Hayden Book Company Inc., 50 Essex Street, Rochelle Park, NJ 07662, (201) 843-0550.

Reader Service ↙ 331

NEW PRODUCTS

Angel—Business Software

Angel is a business software program designed to monitor work flow, deadlines, appointments and schedules on a day-to-day basis.

This program internally adjusts calendar years allowing planning and deadlines in advance. It also gives a complete daily rundown of the day's schedule and can be logged to warn you of upcoming events. Angel has the capacity to log up to 2000 individual projects at once and can be custom-programmed to fill the needs of any business operation.

Angel is available for the Models I, II and III for $295 from Time Management Software, 123 East Broadway, Box 727, Cushing, OK 74023, (918) 225-6340.

Reader Service ↙ 171.

Angel Software

A Real Estate Bookkeeping System

The Real Estate Bookkeeping System is a general ledger system for the Model III with 32K and two disk drives.

This program provides monthly rent statements to landlords, delinquent tenant lists, sales progress for salesmen for month and year-to-date, and the year-end IRS Form #1099. The package also includes interim landlord statements as needed, disbursement analysis by vendor, and a buyer and tenant escrow ledger.

This system is priced at $400 and is available from Tar Heel Systems Inc., Box 340, Burlington, NC 27215.

Reader Service ↙ 161

A Journal for Engineering and Scientific Applications

Access, The Journal of Microcomputer Applications, is designed to meet the needs of those who use micros for engineering and scientific purposes.

Access is published six times a year. Each issue contains book, hardware, and software reviews as well as articles on numerical analysis, simulation, statistics, personal finance, and other topics of interest to engineers and scientists.

A one year subscription rate is $16 from LEDS Publishing Company Inc., Box 12847, Research Triangle Park, NC 27709.

Reader Service ↙ 350

Computax '81

Computax '81 is a group of federal income tax programs for the 16K Level II TRS-80.

Some unique features allow you to easily enter and save data, make corrections and load files from tape at a later date. A complete 1040 and 1040A form can be displayed on the monitor for easy copying; a line-printer version is also available. Programs for the following schedules are marketed: A, B, C, D, E, F, G, R & RP, SE, TC and most major forms.

Computax '81 is priced at $14.95 with an additional $8.50 charge for each schedule desired. Write to Microbyte R&D, Box 8084, Greenville, NC 27834, for additional information.

Reader Service ↙ 325

Word Processing For the Color Computer

Telewriter, a word processor for the Color Computer, provides lowercase letters and a 51-character by 24-line screen display. Done entirely in software, these enhancements require no hardware modifications.

Telewriter features a full-screen text editor, menu-driven and dynamic format control, cassette handler with auto-reentry, and an MX-80 driver with 12 fonts and underlining. Direct output of control codes before or during printing lets it drive any printer.

Telewriter runs in 16K or 32K and costs $49.95, from Cognitec, 704 Nob Ave., Del Mar, CA 92014, (714) 755-1258.

Reader Service ↙ 176

Program Offers Personal Organization

The Guardian software program keeps an accurate calendar of single or entire series of events. Guardian organizes up to 2000 events for up to 200 people at once. Appointments from tax deadlines, anniversaries, or oil changes can be recorded with single one line entries.

All entries and instructions are given in conversational English. Guardian is available for the Models I, II and III for $199 from Time Management Software, 123 East Broadway, Box 727, Cushing, OK 74023. (918) 225-6340.

Reader Service ↙ 169.

Printer Help for Scripsit

Scriptr is a disk-based universal parallel printer-driver modification for Scripsit and any parallel printer.

Its features include: infinite DOS entry and reentry without losing text; output of any code to the printer from the text; preprogrammed functions for all MX-80 and Microline 80 controls including programmable line spacing and forms control on the MX-80; a programmable display; line

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Reader Service ✓ 327

For The Diet-Minded

Nutri-Calc is a dietary nutritional analysis program used to accurately assess your nutrient intake.

The program consists of 730 common foods, given in household measurements, each detailed for 18 common food nutrients. Nutrient values have been taken from USDA listings. Comparisons of input data to the recommended daily allowances for specific subgroups is also provided. Calculations are based on your age and sex, and for infants, weight.

Nutri-Calc is priced at $350 and is available for the Model II. For more information contact PCD Systems Inc., Box 143, Penn Yan, NY 14527, (315) 536-3734.

Reader Service ✓ 342

Tax/Forecaster— More Tax Help for Model I and III Owners

The Tax/Forecaster converts its predecessor, the Tax/Saver, into a tax planner enabling you to see in advance how financial decisions will affect your taxes.

Additional features include the ability to revise an already completed Tax/Saver return and recalculate your tax return.

Tax/Forecaster is available for the Models I and III for $29.95. For additional information contact Micromatic Programming Company, Box 158, Georgetown, CT 06829, (203) 324-3009.

Reader Service ✓ 339

New Basic Editor

Edit is a new full-screen Basic editor for the Model I and III.

The program has a full-floating cursor with autorepeat and over 30 commands for editing Basic text at the character, word, line or block level. A Scripsit-like control structure aids in speedy familiarization and ease-of-use.

Edit is available from Allen Gelder Software, Box 11721 Main Post Office, San Francisco, CA 94101. The price is $40.

Reader Service ✓ 344

Color Computer Light Pen

A light pen is now available for the Color Computer. This pen can be plugged directly into the joystick port or a kit is available which can be attached to one of your joysticks if you enjoy soldering.

The light pen retails for $39.95, the kit for $19.95. Both items are available from Moses Engineering, Route 7, Greensville, SC 29609.

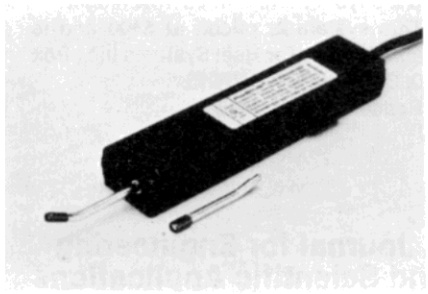
Reader Service ✓ 347

Probe-Type Demagnetizer

The Probe-Type Demagnetizer, Model # 25-023, can be used to demagnetize heads of tape drive units of cassette memories. It can also be used to demagnetize all metal parts. The probe has interchangeable tips for use with most drive mechanisms and is priced at $16.50.

Contact Robins Industries Corporation, 75 Austin Blvd., Commack, NY 11725, (516) 543-5200.

Reader Service ✓ 182.



The Robins Head Demagnetizer.

If your company is currently releasing a new product that is TRS-80 compatible and would like it published in our New Products column, send a news release to Janet Fiderio, *80 Microcomputing*, 80 Pine St., Peterborough, NH 03458.

Please include a photo (if possible), general information, and the price.

80 CALENDAR

January

12-15 Ken Orr and Associates Inc., Topeka, KS. **Course on structured requirements definition,** Toronto, Canada.

18-19 Midwest Scientific Inc., Olathe, KS. **Dealer-user seminar with keynote address by Wayne Green of Wayne Green Inc.,** Kansas City, MO.

18-22 Ken Orr and Associates Inc., Topeka, KS. **Course on structured systems design structured requirements definition,** Houston, TX.

19-22 Ken Orr and Associates Inc., Topeka, KS. **Course on structured requirements definition,** Kansas City, MO.

25 Ken Orr and Associates Inc., Topeka, KS. **Course on management overview of data structured systems design,** Tulsa, OK.

25-29 Ken Orr and Associates Inc., Topeka, KS. **Course on structured systems design and structured program design,** Cleveland, OH.

26-29 Ken Orr and Associates Inc., Topeka, KS. **Course on structured system design,** Chicago, IL.

27 Ken Orr and Associates Inc., Topeka, KS. **Course on management overview of data structured systems design,** Tulsa, OK.

28-29 Construction Industry Press, Silver Spring, MD. **Conference on computers in construction,** San Diego, CA.

29 Ken Orr and Associates Inc., Topeka, KS. **Course on management overview of data structured systems design,** Omaha, NB.

February

6 John Craig's Computer Swap America, Palo Alto, CA. **Flea market for computer enthusiasts,** Orange County Fairgrounds, Costa Mesa, CA.

22-24 The Interface Group, Framingham, MA. **Federal DP Expo—show for end users in the multi-billion dollar federal government marketplace,** Sheraton Washington Hotel, Washington, DC.

26-28 Adventure International, Longwood, FL. **Computer Expo '82 trade show,** Orlando, FL.

March

1-2 Michigan Association for Computer Users in Learning, Wayne, MI. **Sixth annual convention featuring sessions on facets of education uses for computers,** Western Michigan University, Kalamazoo, MI.

3-7 Catalyst, Jersey City State College, Jersey City, NJ. **Microcomputer Week '82, "an international event of significance to educators,"** Jersey City State College, Jersey City, NJ.

12-13 Seattle Pacific University and National Council for Computers in Education. **Fifth Annual Computers in Education Conference,** Seattle Pacific University, Seattle, WA.

22-25 The Interface Group, Framingham, MA. **INTERFACE '82—communications-information conference and exposition for sophisticated end users,** Dallas Convention Center, Dallas, TX.

29-31 American Management Associations, New York, NY. **Course on paperwork management,** New York, NY.

April

1-3 Alaska Association for Computers in Education, Anchorage, AK. **Educational Computing—The Future is Now conference,** Anchorage, AK.

2-4 Kengore Corp., Franklin Park, NJ. **Eighty/Apple Computer Show—an exposition for products and services for Apple and TRS-80 computers,** NY Statler Hotel, New York, NY.

12-14 American Management Associations, New York, NY. **Course on paperwork management,** Chicago, IL.

15-18 National Computer Shows, Chestnut Hill, MA. **Southwest Computer Show and Office Equipment Exposition,** Market Hall, Dallas Market Center, Dallas, TX.

16-18 Virginia Computer User's Conference, Association for Computing Machinery, and Virginia Polytechnic Institute and State University **12th Annual Conference with topics on artificial intelligence, office automation and data-base management,** Marriot Hotel, Blacksburg, VA.

22-25 The National Computer Shows, Chestnut Hill, MA. **New York Computer Show and Office Equipment Exposition,** Nassau Coliseum, Uniondale, Long Island, NY.

24 John Craig's Computer Swap, Palo Alto, CA. **Flea market for computer enthusiasts,** Santa Clara County Fairgrounds, San Jose, CA.

Coming Next Month

How many times have you heard this rap? "Our public schools are manufacturing robots—mindless conforming automatons that can neither read nor write nor add." Or this: "Schools have become dehumanizing institutions stifling creativity and growth." Will computers make this perceived situation worse or better? Join *80 Micro* in February when it looks at those questions and more. James E. Keogh surveys the goals of educational programming; Thomas W. Mustico writes about educational graphics and computer etch-a-sketch; James W. Wood explains how to use the Color Computer in chemistry lab; and 9-year-old Jodi Tallman relates how she learned to write programs. There'll also be the usual grab-bag of games, utilities, applications and reviews to add fascination to your computing life. ■

RELOAD 80

This month, *80 Microcomputing* is pleased to announce that a subscription plan is now available for LOAD80. The introductory price for a 12 month subscription is $99.97. The LOAD80 tapes contain, on the average, 15 programs a month; a subscription will bring you exciting new programs for your TRS-80 at the incredible price of 55 cents each! Who said there are no bargains anymore?

Plans are progressing to produce a disk version of LOAD80. The disk will *not* be available for January programs; production problems have forced us to delay the disk offering until February.

You have probably noticed the LOAD80 logo on the title page of articles containing a program on the LOAD80 cassette. We hope this innovation, along with the monthly LOAD80 Directory, will make your LOAD80 buying decisions easier.

Why does the Directory occasionally show a program that never seems to get on the tape? As it turns out, the magazine is plagued by the same problems you've encountered with your computer. We've been the victims of glitched disks, lost tapes, mislabelled programs and plain old human error. Hence, we offer the following errata column.

Program	Title	Page #	Comments
1	PALLETS	98	None
2	SURVEY	102	None
3	RULE300	116	None
4	MODEL T	140	None
5	ALPHGRPH	190	None
6	NEATLIST	196	None
7	SCRIPGRAFT	230	None
8	TAPESPTE	240	None
9	MARS	265	None
10	VARMAP	304	None

LOAD 80 Directory for January 1982

Errata

The November LOAD80 cassette does not contain the program NEWBUG from the article starting on page 368; our copy got glitched. The December cassette does not contain the ORGANIZE and DDENTRY programs; these were scratched at the last minute due to a lack of space.

There are no plans to offer any of these programs on future LOAD80 tapes; once again, space is at a premium.

This Month

In spite of its length, we have chosen not to include The Ultimate Parts Manager program on our LOAD80 cassette, due to its esoteric nature. If you want a magnetic copy of this program, contact the author directly. ■

COLORTERM (c)

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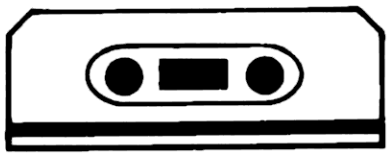

LOAD 80

ELIMINATE HOURS OF TYPING AND AGGRAVATION

LOAD 80 cassettes for BACK ISSUES of 80 Microcomputing now available

In the April, 1981 issue of 80 Microcomputing, we introduced LOAD 80 to save you the time and trouble of typing our programs yourself. LOAD 80 cassette tapes contain dumps of the major program listings in 80 Microcomputing.

If you have not yet ordered any LOAD 80 tapes and wish you had, don't worry. We are now offering a "back issue" cassette program. You can order any LOAD 80 cassette from April, 1981 to date for $9.95. Back issues of 80 Microcomputing are also available with the LOAD 80 cassettes for $3.50. With the complete documentation found in the companion magazine issue, you should have no difficulty loading any of 80's major programs.

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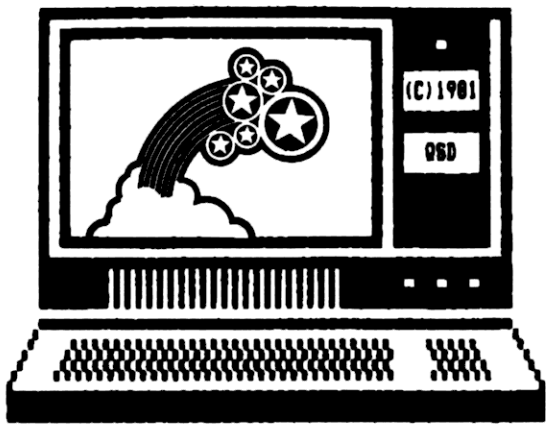

SCRIPLUS 3.0

Scriplus is a modification to Scripsit(c) which enables you to take advantage of the special functions, features, and print formats of your printer while your document is being printed. Allows you to:

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3) "END" returns to DOS READY instead of re-booting.
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5) The user can get an ALPHABETIZED directory from within scriplus.
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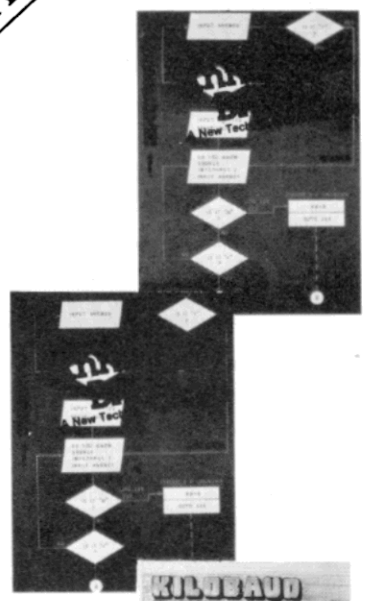

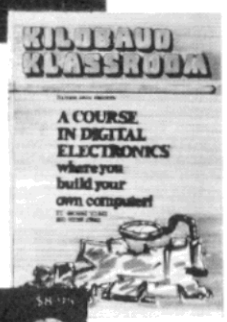

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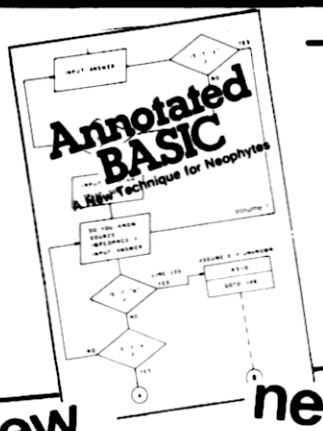

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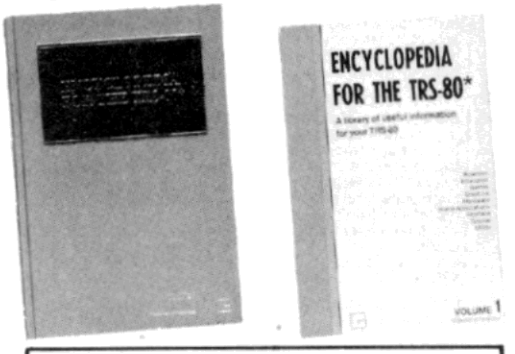

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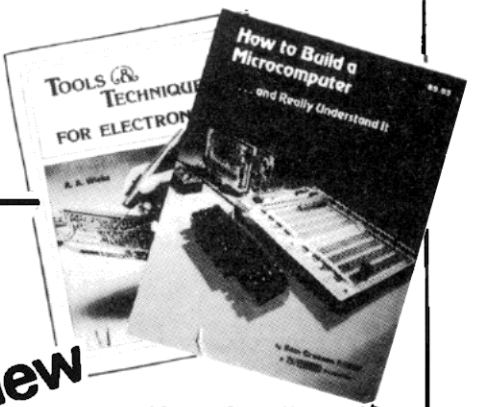

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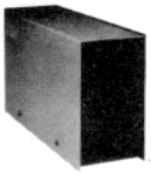

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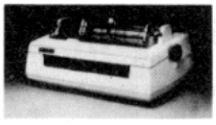

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334	A.M. Electronics	386
333	A.M. Electronics	386
445	AT-80	118
129	Aardvark 80	104
229	Access Unlimited	58, 59
265	Ace Computer Products	250
34	Acorn Software Products, Inc.	367
329	Acorn Software Products, Inc.	386
348	Advanced Operating Systems	254
335	Advanced Operating Systems	383
162	Advanced Operating Systems	386
222	Adventure International	46
224	Adventure International	57
97	Adventure International	47
311	Adventure International	345
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124	Alphanetics	208
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138	The Alternate Source	256, 257
529	American Business Computers	301
526	American Business Computers	90
527	American Business Computers	90
528	American Business Computers	90
560	American Business Computers	90
561	American Business Computers	90
562	American Business Computers	90
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565	American Business Computers	91
520	American Business Computers	237
521	American Business Computers	237
118	Analytical Processes Corp.	333
343	Anawan Computer Services	388
461	Ancle Labs	308
264	Apparat, Inc.	291, 239
*	Archbold Electronics	54
491	Arcsoft Publishing	192
449	Aspen Software Company	123
*	Astro-Star Enterprises	353
398	Aton International	380
48	Automated Simulations	65
122	B.T. Enterprises	272, 273
*	Back Issue	387
*	BAP$ Software	32
*	BargainByte	323
49	Basics and Beyond, Inc.	298
186	Baysian Investment Services	152
237	BCcompco	287
95	Beard Software Development Company	86
260	Becker Electronics	353
357	Big Five Software Company	7
*	Binders	387
*	Books	395, 396, 397, 398
582	Bonita Computer Software	333
416	Bosen Electronics	252
551	The Bottom Line	333
552	The Bottom Line	339
*	Bulk	394
459	CMD Micro Computer Services Ltd.	156
438	CMP Industries	54
219	CP/$	131
	CPAids	238
298	The CPU Shop	389
145	C&S Electronics Mart Ltd.	173
431	Clark Consultants	387
191	Cleveland Electronics	361
32	Cload Magazine, Inc.	143
502	Cload Magazine, Inc.	142
213	Clockwork Software	339
178	Cognitec	389
588	Color Software Services	387
263	Communications Electronics	400
107	Computer Applications Unlimited	284
199	Computer Case Company	97
584	Computer Design Labs	314
372	Computer Discount of America	175
119	Computer House	167
22	Computer Information Exchange	155
130	Computer Plus	197
212	Computer Shopper	259
*	Computer Technical Services of NJ	380
177	Computerware	386
198	Computer Wit, Inc.	150
392	Computex	70, 71
9	Computronics, Inc.	209-216
204	Comsoft	222
10	Contract Services Associates	389
78	Coosol Inc.	107
465	Cornsoft Group	64
378	Cornucopia Software	307
36	Corsair Computer Co.	168
415	Cosmopolitan	377
233	Cottage Software	166
98	Creative Computer Center	251
108	Crown Microproducts	315
121	Custom Electronics	154
*	Cybernetics, Inc.	287
*	DSC Publishing	223
348	DSC Publishing	388
540	Data Resources Corporation	21
587	Data Score	333
249	Data Services, Inc.	228
407	Datasoft Inc.	305
274	Data Trans	112
*	Dealer List	195
567	Dekela Computer Service	323
583	Designatron	167
123	Design Solution, Inc.	261-264
*	Desktop	313
440	Discount Software Group	73
30	Displayed Video	117
88	Documan Software	29
592	E.A.P. Company	162
278	ESI Lynx	297
5	E-Z Software	164
303	Educational Programs	333
163	Educomp	388
477	Edu-ware	255
510	Eigen Systems	385
	80 Microcomputing Subscription Ad	286
33	80-US Journal	296
58	Electronic Specialists	136
456	Eltech Associates	325
*	Encyclopedia	114, 115
404	Epson America, Inc.	221
3	Exatron	CIV
187	Exatron	157
446	Excellonix	154
225	Fantastic Software	9
141	Field Engineering Consultants, Inc.	158
214	William A. Fink	323
462	Fort Worth Computer	323
338	GB Associates	382
39	G&L Software Enterprises	176
*	Galactic Software	41
281	Golden Braid Software	248
218	Good Lyddon Data Systems	246
394	Gooth Software	323
284	Gosub International, Inc.	361
*	Gypsy	194
223	H&H Trading Company	293
346	H&H Trading Company	383
*	HW Electronics	96
464	Dan G. Haney & Associates Inc.	368
331	Hayden Book Company, Inc.	388
178	Hayden Book Company, Inc.	383
383	Health/Zenith Company	63
125	Hexagon Systems	112
288	Hikari Group	246
401	Holmes Engineering	287
103	Howe Software	156
86	ICR Futuresoft	145
*	IJG Inc.	97, 289, 351
467	I.M.B.	348
305	Insiders Software Consultants Inc.	147
	Instant Software Inc.	
	Smart Programmer	339
2	Programmer's Kit	158, 254, 325, 352, 339, 387
531	Easy Calc	76
530	Master Reversi	77
532	Super Terminal	78
	Memo	75
533	General Ledger	188, 189
246	Interface, Inc.	160
323	J.C. Datatron	343
159	JES Graphics	254
215	JMC	381
190	JPC Products	249
85	Johnson Associates	109
160	The Journal of Computers in Mathematics and Science Teaching	386
216	KSoft	136
256	KAM Enterprises	387
126	Kelson Delphi	350
*	Kengore Corp.	207
250	Kern Publications	280
192	Keyline Computer	132
571	LNW Research	271
53	LNW Research	45
572	LNW Research	199
571	LNW Research	132
11	LT Data, Inc.	253
106	Lawyers Microcomputer, The	315
81	LEDS Publishing Company, Inc.	279
350	LEDS Publishing Company, Inc.	389
63	Thomas V. Lenz	107
61	The Liberty Software Company	298
57	Libra Labs, Inc.	74
391	Lindbergh Systems	232
566	Lizcon Trading	123
*	Load-80	50, 393
74	Lynn Computer Service	109
172	MFJ Enterprises Inc.	386
598	MG Products	252
451	MTS Enterprises	160
340	Manhattan Software Inc.	384
261	Mark Data Products	133
341	Mark Data Products	384
583	Market Management Systems	159
196	Martin Consulting	392
84	Master Electronics	277
421	Medfield Computer Software	248
128	Med Systems Software	119, 120, 121
262	Menlo Systems	150
104	Mercer System, Inc.	164
185	Mesa Power	382
217	Metaphonic Associates	298
20	Meta Technologies Corporation	11, 13, 15, 17
54	Micro Architect	109
175	Micro Architect	382
325	Microbyte R&D	389
28	Microcomputer Technology Inc.	CII, 89
248	MicrOdome	277
379	Micro-Design	106
476	Micro-80	365
470	Micro-Grip, Ltd.	220
359	Micro-Images	112
46	Micro Investment Software	309
89	Micro Learningware	250
16	Micro Mainframe	337
72	Micro Management Systems, Inc.	161
423	Micro Management Systems, Inc.	281
355	Micromatic Programming Company	234
339	Micromatic Programming Company	390
29	Micro Mega	222
310	Micro Mint	146
306	Microperipheral Corp.	270
579	Microsoft CPD	331
345	Micro/Sys80	384
384	Micro Systems Software, Inc.	202, 203
486	Micro Tax	250
362	Microtek, Inc.	205
109	Micro Works	144
578	Midwest Data Systems	306
537	Mikee Electronics Corp.	321
112	Miller Microcomputer Services	151
24	Mini Micro Mart Inc.	401
221	MISOSYS	292
94	Morgan Products Inc.	242
347	Moses Engineering	390
*	Moving	394
336	Multi-Media Systems Inc.	386
337	Multi-Media Systems Inc.	388
144	Mumford Micro Systems	373
135	NDM Designs	293
*	NRI Schools	267
480	Nelson Software Systems Inc.	299
389	Omega Sales	317
367	Omikron	165
105	Omnitek	365
480	Options-80	323
376	Orion Instruments	260
342	PCD Systems Inc.	390
127	P.C. Newsletter	368
595	P.M.W.	255
370	Pacific Exchanges	162, 333, 348, 352
153	Pacific Office Systems	132
64	Pan American Electronics	133
253	Panoramic Young	333
586	Penner Bros., Inc.	182
207	Pensadyne Computer Services	292
1	Percom Data Company	3
429	Percom Data Company	3
258	Percom Data Company	3
*	Percom Data Company	34, 35
51	Perry Oil & Gas	138
568	Personal Tax Software	339
*	Phase I Systems	285
272	Pickles & Trout	222
101	Pioneer Software	187
327	Pioneer Software	390
131	Plus Computer Tech. Inc.	233
27	Powersoft	99, 153, 393
348	Practical Programs	384
435	Precision Prototypes	379
189	Probability Research, Inc.	227
408	Process Control Tech.	359
17	The Program Store	374, 375
384	The Programmers Guild	275
241	Programmers Institute	242
110	Programs Unlimited	349
277	Progressive Electronics	133
441	Prosoft	95
139	Prosoft	88
271	Quant Systems	93
41	Racet Computes	243
133	Radio Ranch, Inc.	107
102	The Rainbow	246
236	Rand's Inc.	159
*	Reality Software Company	339
374	Refware	235
77	REMarkable Software	309
70	Remsoft Inc.	283
276	Richcraft Engineering Ltd.	158
180	Robins Industries Corp.	384
182	Robins Industries Corp.	390
183	Robins Industries Corp.	383
118	Rogo Computer Products	325
266	Rontel Inc.	333
373	SID	193
143	Sales Data, Inc.	292
388	Schneider Enterprises	247
291	Scientific Engineering Lab.	246
542	Shannon Magnetics	19
*	Shell Boxes	394
19	Simutek	169, 170, 171
91	68 Micro Journal	348
*	Snappware	81, 83, 85, 87, 89
496	Soft Sector Marketing Inc.	125
515	Soft Sector Marketing Inc.	127
516	Soft Sector Marketing Inc.	129
292	Softtouch Software Inc.	323
356	Software Affair	138, 139
299	Software Concepts	268, 269
13	Softwarehouse International	201
*	The Software Plantation, Inc.	163
188	Software Support	111
454	Sound Center Radio Shack	68
209	Southfork Software Inc.	339
275	Speedway Electronics	385
132	Spectral Associates	371
317	Standard Microsystems Inc.	178
164	Standard Microsystems Inc.	388
511	Starbuck Data Company	352
326	Starbuck Data Company	384
255	Stark Software	108
438	The Stocking Source	193
550	Storybooks of the Future	339
82	Sturdivant & Dunn, Inc.	315
150	Sublogic	355
*	Subscription Problems	387
151	Sun Research	223
301	Suntronics Company Inc.	245
403	Superior Software	154
321	Synergetic Solutions	361
*	Synergistic Solar Inc.	191
139	Syntax Electronic Innovations	251
358	Syracuse R & D Center	152
80	Systemworks	381
285	Syzygy	168, 333
148	Tab Sales Company	177
45	Taranto & Associates	357
161	Tar Heel Systems, Inc.	389
211	Tatum Labs	315
121	Technical Software Systems	323
25	Texas Computer Systems	149
170	Time Management Software	383
169	Time Management Software	389
171	Time Management Software	389
6	Total Access	105
8	Trax	55
16	Twenty First Century Software	277
43	Universal Software Studios	135
*	University Microfilm	387
*	V R Data Corporation	362, 363
137	Van Horn Office Supply	309
553	Videotronics	168
114	Voicetek	150
363	Walonick	223
433	Warlock Warehouse	166
113	Warlock Warehouse	319
580	Western Operations	108
328	David C. Whitney Assoc., Inc.	382
279	Wilson Software	315
386	XYZT Computer Dimensions Inc.	295
482	York 10 Computerware	279

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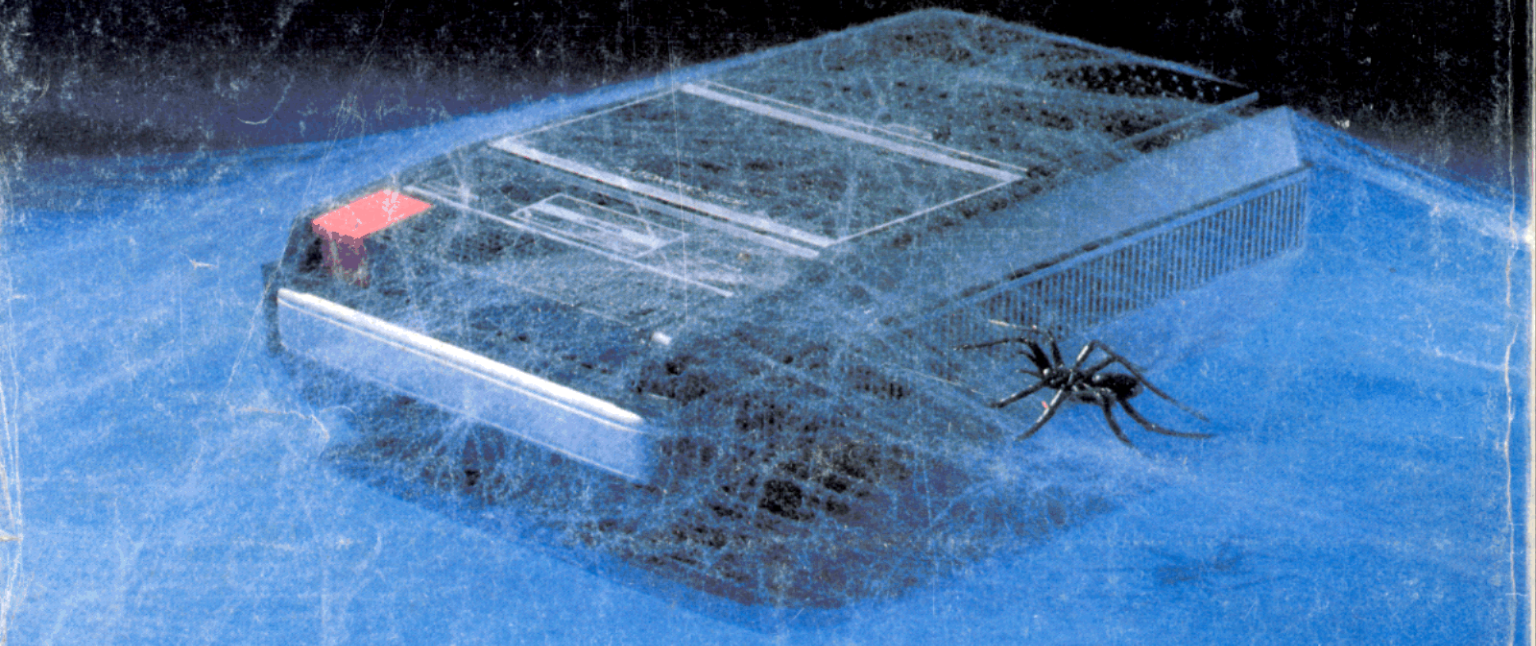

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3

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